TECHNOLOGY DEPT.

JULY 1952

FOUNDRY

WHEREVER METALS ARE CAST

LIBRARY 1952

AUTOMATIC DEVICES

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Which Investment Material for Precision Castings?—page 92

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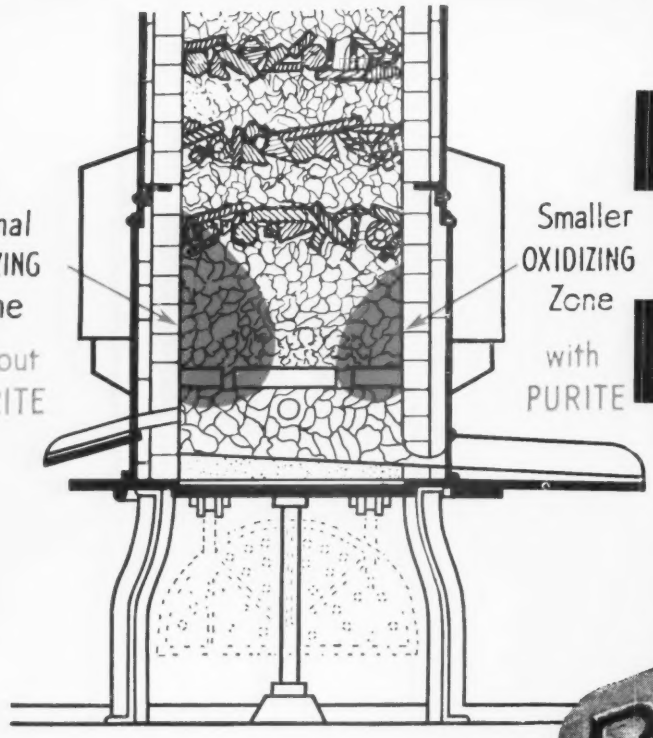
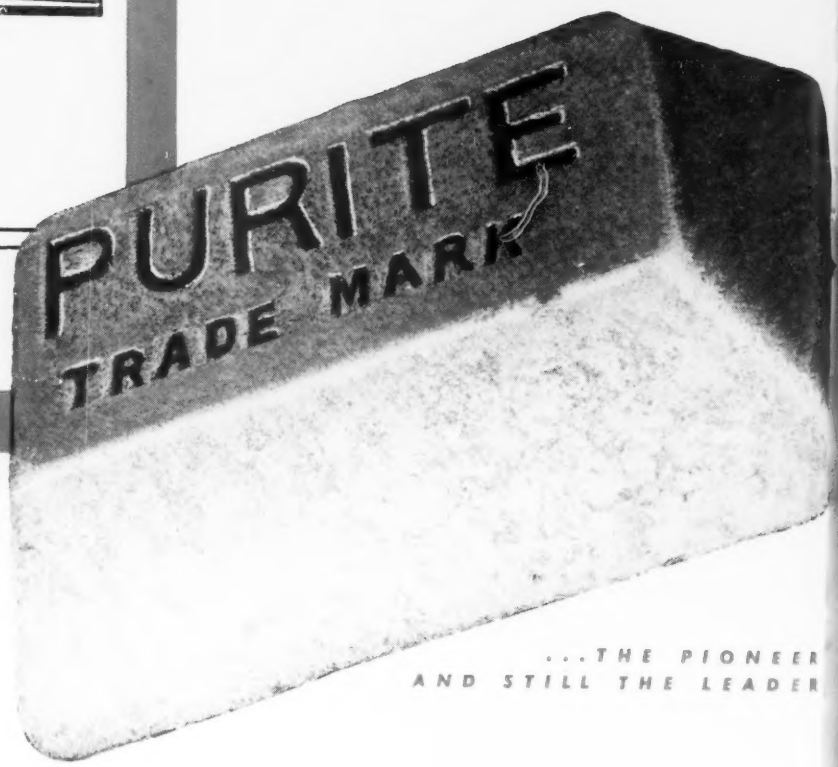
Keep Production Uniform

with PURITE in Every Melt



Purite produces a sodium (yellow) flame in the melting zone of the cupola and accelerates the combustion reactions $C \rightarrow CO_2 \rightarrow 2CO \rightarrow 2CO_2$, thus speeding up the combination of oxygen in the blast and carbon in the coke. In this way, Purite limits the zone of free oxygen in the cupola to a smaller hotter area, reduces oxidation of the metal and increases melting temperatures.



To get top production of finished castings from every melt, be sure you flux and desulphurize with Purite. It forms a highly active refining slag in the hearth of the cupola which expels entrapped gases and reacts with the impurities picked up by the iron in trickling down over the coke. Non-metallic inclusions are converted into liquid sodium-silicates that rise out of the metal and are carried off in the slag. Thus Purite, by expelling the impurities, which cause pinholes and segregated defects, improves the soundness and machinability of iron castings and reduces foundry losses.

For over 30 years, Purite has been the choice of leading foundries everywhere. Here's why:

1. Purite produces a higher percentage of finished castings per ton of metal poured.
2. Purite gives 100% fluxing action in the cupola—100% desulphurizing action in the ladle.
3. Purite gets to all the iron quicker.
4. Purite is time-tested and proven for unsurpassed desulphurizing uniformity.
5. Purite comes in 2-lb. pigs and 2 oz. tablets—no weighing or measuring required.
6. Purite is 100% pure fused soda ash—you do not pay for inert materials.
7. Purite does not crumble—no waste—no dust.
8. Purite can be shipped in bulk carloads at substantial savings over bag shipments—is easily stored without deterioration.

Purite, the scientific flux for better melting and cleaner iron, is sold by leading foundry supply houses in the United States and Canada. Mathieson Chemical Corporation, Baltimore 3, Maryland.

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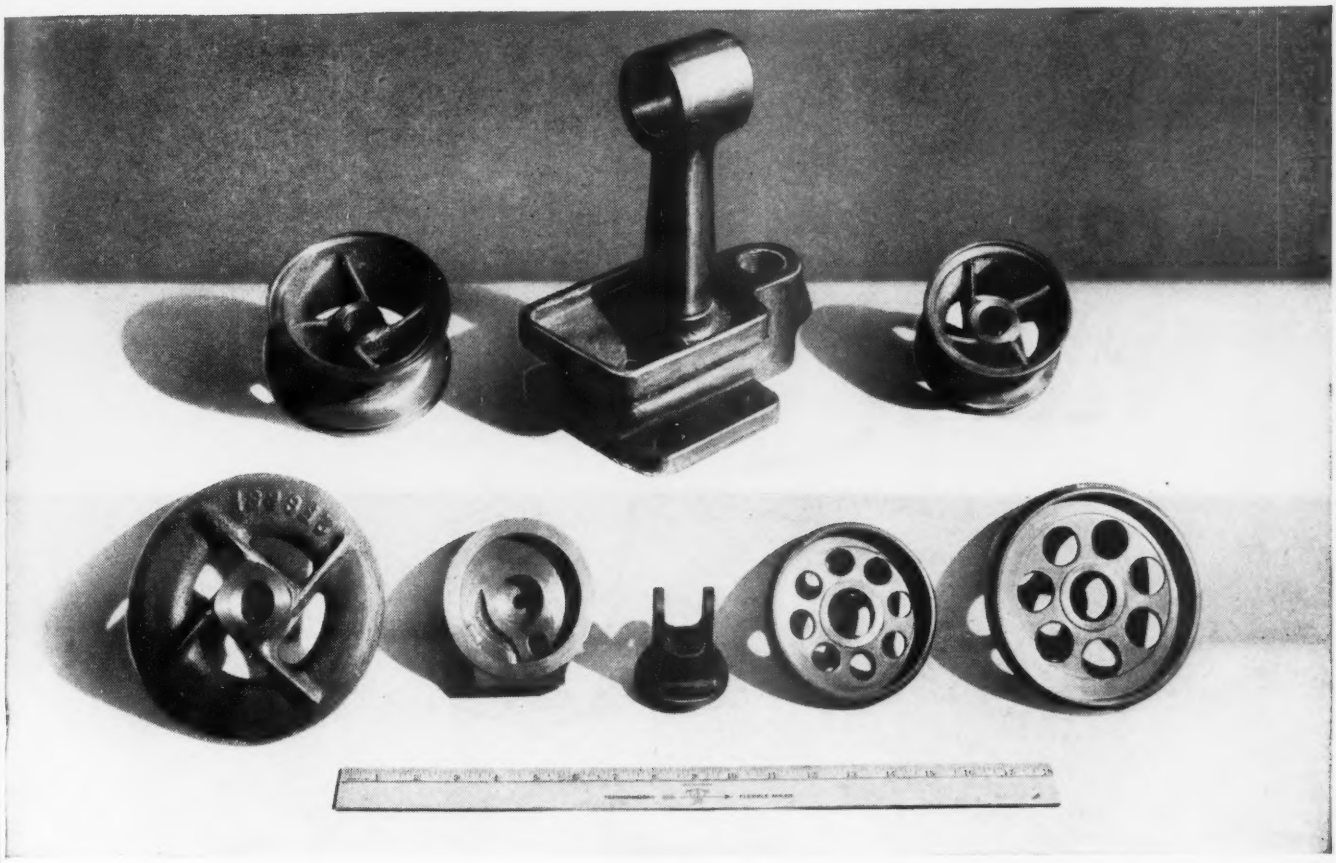
CHEMICALS

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH

NISILOY*

to eliminate hard chilled areas in gray iron castings

. . . REDUCE machining time, tool wear, rejections



Produce *machinable* gray iron castings regardless of sharp variations in section thickness . . .

Eliminate localized hard areas or chilled (white) edges and surfaces . . .

Reduce machining time, tool wear and rejections . . . *raise both quality and quantity of your output by controlling gray iron structure with small ladle additions of NISILOY.*

Designed specifically to promote better machinability, NISILOY is a powerful innoculant and graphitizer containing about 60% Nickel, 30% silicon, balance essentially iron.

Mail the coupon now . . . for your *free* copy of a booklet that describes how Nisiloy helps you improve structure and machinability of gray iron castings.

*Trade Mark of The International Nickel Company, Inc.

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JULY 1952

FOUNDRY

Volume 80—Number 7

NBP · CCA

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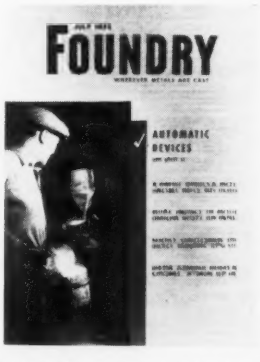

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THE LOGICAL OIL

LINOIL USERS

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PROOF that LINOIL UNIFORMITY helps keep trouble out of the core room, scrap out of the foundry!

● Sacks-Barlow Foundries, Inc., and Newark Malleable Iron Works, Newark, N. J., are two foundries in one. Like numerous core oil users, their constant use of LINOIL through the years is proof of unvarying quality.

If you're having trouble in the core room, call in a LINOIL man for an analysis of the problem ...and a solution!

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Advertisement

Experienced Foundrymen Know—

PANGBORN DUST CONTROL saves money, boosts efficiency!

Big Pangborn "CH" Dust Collector serves Garden City Foundry's grinding wheels and blast cleaning machines in Stoughton, Wisconsin.

Pangborn Dust Control at Flury Foundry, Lancaster, Pa., stops dust caused by blast cleaning operations.

EVER stop to think how much of your profits are lost as "dust"? And how this loss can be stopped, when the "dust" it collected at the source? That's the job Pangborn Dust Control does for you! It pays off in increased profits due to better worker efficiency, better products —and often, additional revenue from material salvaged from the "dust".

For example, a Pangborn "CH" Dust Collector at the Penn Steel Castings Co., Chester, Pa., protects blast cleaning equipment from excess abrasive dust and furnishes employees a dust-free working area! Both add up to considerable savings for Penn!

And at Flury Foundry, Lancaster, Pa., Pangborn actually pays its own way . . . a result of increased efficiency brought about when dust caused by blast cleaning operations was eliminated *right at the source!*

These are just two of the companies using Pangborn Dust Collectors to solve dust problems and increase profits. Whether your particular dust problem is the result of blast cleaning operations, finishing processes, or other causes that can be stopped at the source, Pangborn will save you money!

GET THE FACTS about Pangborn Dust Control today. Write for free Bulletin No. 909A to: PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Md.

Pangborn DUST CONTROL

STOPS THE DUST HOG from stealing profits

If you haven't heard it . . .

IT'S NEWS!

HERE'S ONE TO PASTE IN YOUR HAT: Never speak unless you can improve on silence.

* * *

CHLOROPHYLL is a word most of us never knew was in the dictionary up to a couple of years ago. Now chlorophyll-ed products are selling at a rate of 35 million dollars a year and we are just getting started. Latest additions to the rapidly growing list: a prepared canary feed containing chlorophyll (strictly for the birds) and a chlorophyll-treated smoking tobacco warranted to sweeten the nauseous briar. About all we need now is chlorophyll-treated onions and garlic.

* * *

WE CAN UNDERSTAND chlorophyll in toothpaste. Or even in a dog food. But last week we ran into one to end them all—chlorophyll-treated inner soles!

* * *

WE HEAR A LOT OF TALK about the terrible state of this country's economy but when we read recently that there is a backlog of 88,000 orders for Cadillacs, we began to wonder.

* * *

SPEAKING OF ORDERS, it is quite apparent that the new Pangborn GN Barrel, displayed for the first time at the AFS Show in May and still unnamed, has won acceptance by American industry. Visiting foundrymen said a lot of nice things about it in Atlantic City but the way they are backing up their judgment with orders (37 sold already) is the real determining factor.

* * *

THE NEW PANGBORN BARREL, boasting many improvements over anything previously available, may be the answer to your blast cleaning problems. Many production men have already labeled it the finest batch-type blast cleaning machine built anywhere. With all the modesty we can muster, we're inclined to agree. For details and prices, write Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.

* * *

I ALWAYS WANTED to be a railroad engineer. Of course, that was when I was a kid. Now that I am grown I'd rather be the conductor: he gets to carry home all the comic books kids leave on the train.

* * *

WELL, ANYWAY THERE IS ONE THING to be said for ignorance: it sure causes a lot of interesting arguments.

37 NEW PANGBORN ROTOBLAST® BARRELS sold since Foundry Show

The new Rotoblast Barrel on display in Pangborn's booth at the Foundry Show in Atlantic City.

Mr. W. I. Gladfelter, Chief Engineer of the Pangborn Corporation, points out several of the outstanding features of the new Barrel. Note the abrasive-tight door that rolls up when opened; the metal-slat work conveyor designed to prevent clogging; and most important, the sparkling-clean castings turned out by the new machine!

ALL OVER the foundry industry they're talking about—and buying—the new Pangborn "GN" Rotoblast Barrel introduced at the Foundry Show! *Thirty-seven* of the new barrels have been sold already—the demonstration machine was bought from the floor within hours after the Show opened!

Check these features—you'll see why this new Rotoblast Barrel has gone over so big:

• Non-clogging Work Conveyor • Automatic Throw-Out Torque Arm for protection in case of jams • Abrasive-tight Door and Housing—door rolls up compactly when opened • New Cleaning and Reclaiming System for continuous removal of sand and debris • Positive action Work Loader • Models currently available 6 cubic feet and 12 cubic feet capacity. PLUS famous *Rotoblast* that saves these 5 ways: *Saves labor* with push button operation; *Saves space* because machines are compact; *Saves time* by cleaning more loads per day; *Saves power* since no compressor is needed; *Saves tools* because all scale is removed.

For more information, write: PANGBORN CORP., 1400 Pangborn Blvd., Hagerstown, Maryland.

CONTEST WINNER TO BE ANNOUNCED IN AUGUST

The judges are studying the entries to Pangborn's "Name the New Barrel" contest right now, and the winner will be announced in the August issue of *Foundry* magazine. In the meantime, thanks for entering, and good luck!

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

OVER 28,000 PANGBORN MACHINES SERVING INDUSTRY

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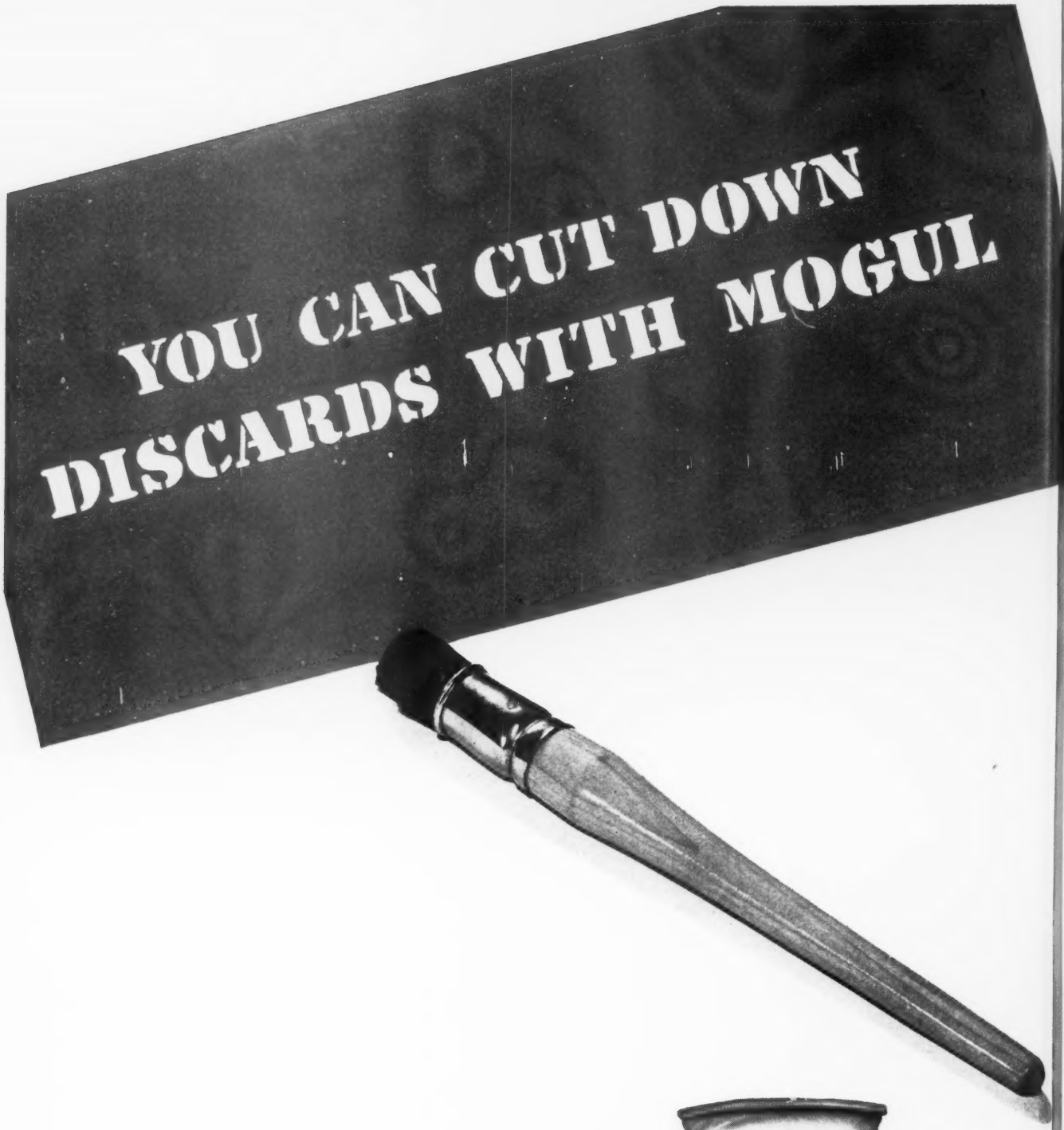
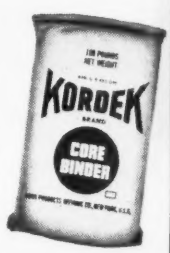
BLAST CLEANS CHEAPER

with the right equipment for every job

YOU CAN CUT DOWN DISCARDS WITH MOGUL



LARGEST SELLER IN THE FIELD!



Kordek, the preferred dry bond for cores . . .

• CUTS DRYING TIME • MAKES SMOOTHER CORES

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Core baking, pasting and mold drying ovens as well as casting conditioning and heat-treating ovens are available in standard units.

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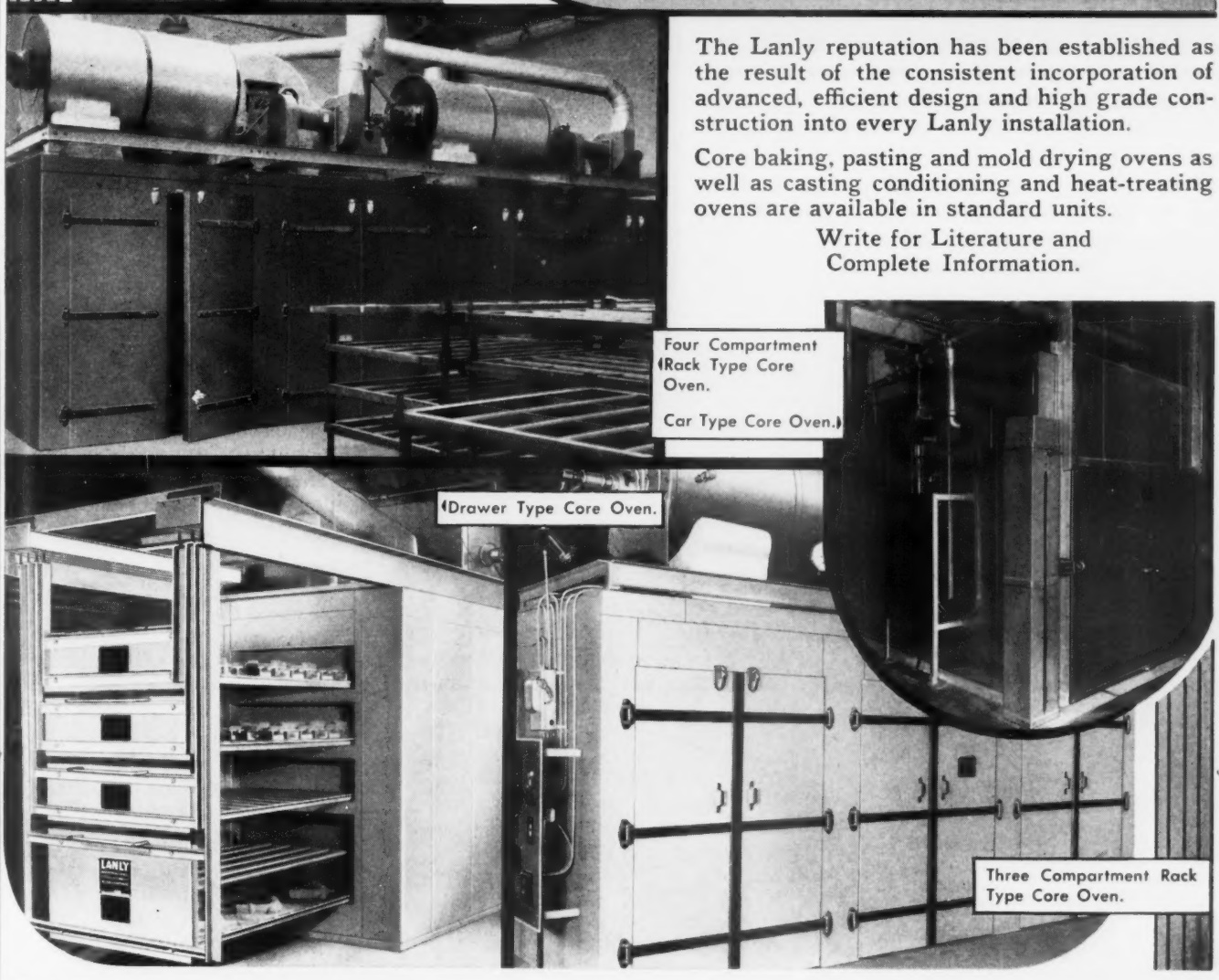
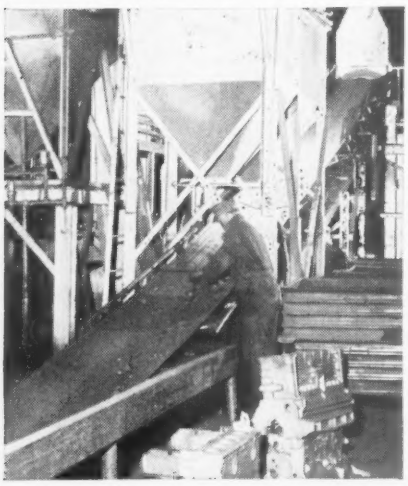


NASH TESTS COMPETITIVE BELTS

by piecing sections together



. . . and Imperial Rexall outwears all the others

Several years ago Nash Motors of Kenosha wanted to determine the best belt to use on the conveyor pictured here. So they pieced together several competitive brands and ran this combination belt in actual service for months. Standard Rexall showed such superior resistance to the tough wear of rough abrasive metal that it easily won this test and has since been used continuously on this conveyor. This belt is 30" x 6-ply, 615 feet long. It handles cores, rods, scrap, sand, shot and other refuse.

Job-Designed Belting

Standard Rexall is tightly woven from finest 37½-ounce silver duck. Plies are double-stitched with inner-locking stitches which positively prevent ply separation. The belt is saturated with special impregnating compounds to condition it for the service in which it will be used. Standard Rexall is ideal for conveying metal parts, castings, metal scrap, heavy boxes, crates and bags . . . and for conveying and elevating bulk materials such as clay, sand, coal, etc. It has a very low coefficient of sliding friction.

For new installations or replacements, there's an Imperial Belt that will cut your handling costs. Write for Data Sheet 51-9 and prices.

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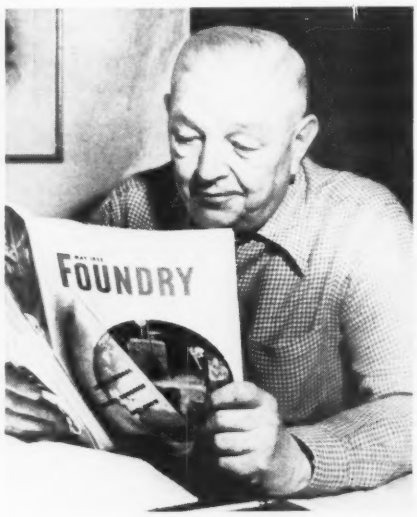
BELTING CO.
1755 S. Kilbourn Ave., Chicago 23, Ill.

Engineered Belting
—The Right Belt for Each Job

With the EDITORS

REGULAR READER: The *Detroit Free Press* has been running a series of articles dealing with many of the smaller communities of Michigan, and on Monday, May 26, reported on Lapeer. The following day we received a number of copies of this story sent along by friends around Detroit. The answer was simple. One of the six illustrations was that of E. T. White, as reproduced here, with the caption, "Deep Roots has Foundryman E. T. White." The



article points out that Mr. White is secretary of the Bostick Foundry Co. and "a visit to White's stately home makes big town boys wonder why they decided to take up residence in the asphalt jungles of the cities." The house was built by Mr. White's grandfather in 1837. In addition, we think Mr. White certainly is a good judge of foundry literature. And we thank the *Detroit Free Press* for enabling us to run this splendid photo of "FOUNDRY and the Foundryman."

—o—

Winners: Results of several other drawings held at the Atlantic City Show have been made available since the list was published in the June issue:

Winners of clock radios at the booth of General Electric Co. were as follows: R. Dyner, Marathon Foundry & Machine Co., Wausau, Wis.; Larson Wiles, Lynchburg Foundry Co., Lynchburg, Va.; C. Sears, International Harvester Co., Indianapolis; Alice Dunker, Dunker Mfg. Co., Millville, N. J.

Winners of the Golden Hour clock at drawings conducted by the Lindberg-Fisher Melting Furnace Division, Lindberg Engineering Co., Chicago, were: Alfred A. Diebold, Atlas Steel Casting Co., Buffalo; D. C. Mathewson, Aluminum Co. of America, Bridgeport, Conn.; Walter Powell, Scott Aviation, Depew, N. Y.; T. G. Hobbs, Lynchburg Foundry Co., Lynchburg, Va.; E. G. Tetzlaff, Pelton Steel Casting Co., Milwaukee; and N. J. Rosmando, U. S. Pipe & Foundry Co., Burlington, N. J.

The Pennsylvania Glass Sand Corp., Pittsburgh, conducted a guessing contest on the grains of sand in a bottle. A hand count by the company's laboratory showed 19,366 grains. The camera prize was won by W. G. Nebgen, Caterpillar Tractor Co., Peoria, Ill., with a guess of 19,400 grains.

—o—

Why Tear Down? Publicity men should learn that it is not necessary to damn present practices to create interest in new processes. For example, a recent Associated Press dispatch from New York on shell molding contained several slaps at sand mold foundries, as follows:

"Shell-molding will reduce the back-breaking, dirty and costly job of making sand molds for metal castings to a push-button operation so easy and simple that unskilled women workers can perform it . . .

"In conventional sand molding, husky foundry workers wrestle with huge, heavy frames of metal or wood called 'flasks' inside which sand is rammed against wooden patterns."

The spokesman who gave the interview should stick to shell molding. He does not know much about the foundry industry in general.

—o—

Salesman of the Year: The editors are mighty proud that Jack Ahrens recently won the "Space Salesman of the Year" award of the Industrial Advertising Association of New York. Over a period of 35 years Jack has done a wonderful job of representing this publication in the East. Congratulations on this honor, Jack; and many thanks for bringing the reflected glory to FOUNDRY.

—o—

Art Collector: The Dallas Museum of Fine Arts recently held a showing from the private art collections

(*Concluded on page* 12)

CRUCIBLES

Developed into

THE WORLD'S MOST EFFICIENT NON-FERROUS MELTING UNIT

No one knows how long it took one of the ancients to melt a few pounds of bronze—probably all day.

Now with Crucibles, foundries are melting 240 lbs. of bronze in seventeen minutes or fourteen pounds per minute!

The illustration shows the cleanliness and efficiency obtainable with Crucible furnaces.

Comparable results are achieved with other fuels generally available for Crucible melting.

WRITE CRUCIBLE MANUFACTURERS ASSOCIATION FOR "CRUCIBLE MELTERS' HANDBOOK"; MAILED FREE. OR ASK ANY CRUCIBLE MANUFACTURER ABOUT SIZES AND SHAPES AVAILABLE.

Installation of Electric Induction Crucible Furnaces at Wollaston Brass and Aluminum Foundry, North Quincy, Mass., consists of two No. 80 Crucible furnaces lift coil type and one tilting Crucible furnace (not shown) 800 lbs. bronze capacity. Illustration shows method of alternate use of Crucibles by lifting the furnace coil and replacing full hot Crucible with cold Crucible already charged.

REPRINT FROM "FORTUNE"

CRUCIBLE MANUFACTURERS ASSOCIATION

27 WILLIAM STREET, NEW YORK 5, NEW YORK

THESE FIRMS CAN TAKE CARE OF ALL YOUR REQUIREMENTS FOR CRUCIBLES

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LAVA CRUCIBLE-REFRACTORIES COMPANY

VESUVIUS CRUCIBLE COMPANY

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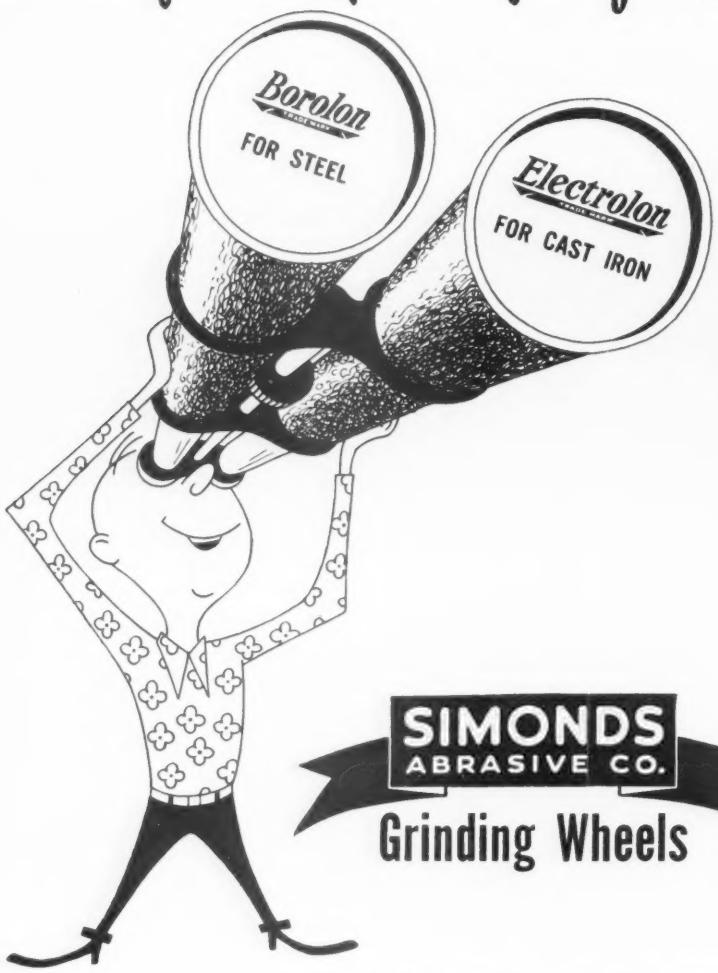
ELECTRO REFRACTORIES & ABRASIVES COMPANY

JOSEPH DIXON CRUCIBLE CO.

Better grinding in sight for YOU!



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Grinding Wheels

Look to Simonds Abrasive Company grinding wheels for the utmost in grinding efficiency and economy. You'll find the right wheels for *all* your jobs in Simonds complete line . . . Borolon (aluminum oxide abrasive) and Electrolon (silicon carbide abrasive) grinding wheels in vitrified, resinoid, silicate, shellac (elastic) bond processes in all shapes and sizes . . . mounted wheels and points, segments and abrasive grain . . . consistently dependable production tools . . . accurately specified and manufactured under exacting Simonds conditions of quality control.

Send for free data book and name of your distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

(*Concluded from page* 10)

of about 2000 business men. Anthony Haswell of Dayton Malleable Iron Co., Dayton, showed a painting "High Noon" by Edward Hopper. In reporting on the showing *Business Week* in the issue of May 3 carried cuts of both Tony and the painting.

—o—

Hero: Thomas E. Lund Sr., burning foreman in the Foundry Division, Omaha Steel Works, Omaha, Nebr., has been awarded the bronze Car-

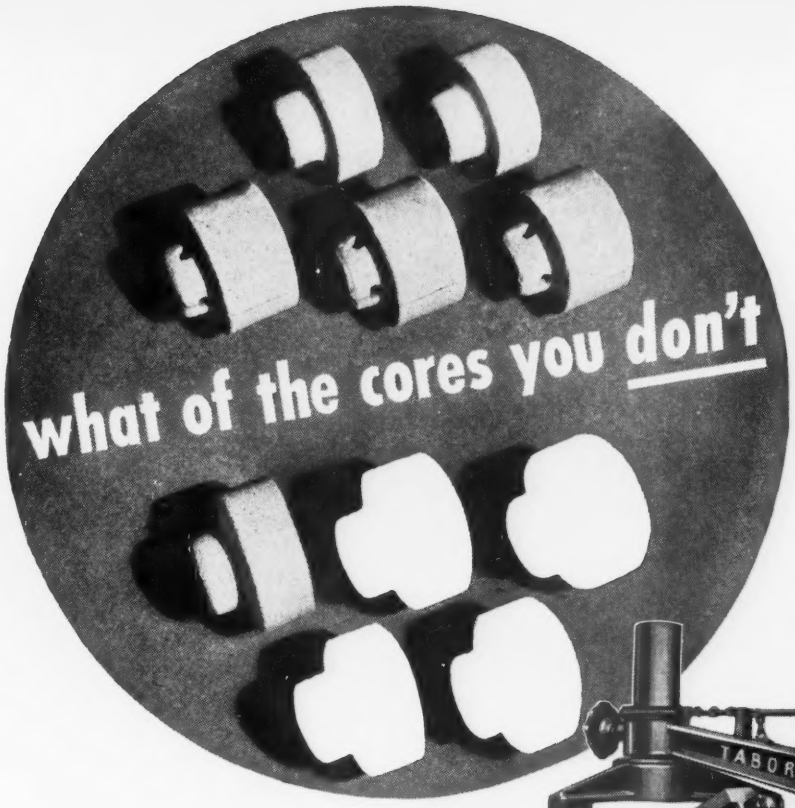
negie Hero Medal together with a cash award of $500 and $50 a month disability benefits for a period not to exceed two years.

On July 15, 1951, at an automobile race track near Bellevue, Nebr., a racing car went out of control and crashed into a guard rail. Mr. Lund snatched a boy, Larry M. Allen to safety, thereby saving his life. Mr. Lund was severely injured, but now is back at work on a part-time basis. However, he works under the difficulty of having a steel brace on his leg. Omaha Steel Works and the entire foundry industry are proud of Mr. Lund.

—o—

Old Timers: Bob Kennedy had a lot of fun at the convention pinning service buttons on those who have been associated with the foundry and related industries for 25 years or more. Harry Richey, who draws the Bill story cartoons for FOUNDRY, caught Bob presenting the button to

Earl Shaner, chairman of the Penton company. Hope you read George Pope's tribute to Bob on page 328 of the June issue. F.G.S.



...but what of the cores you don't make?

We mean the extra 40% production you lose

. . . those additional cores that a Tabor Rollover Core Machine could turn out for you in the same time.

The reason for "upped" production of small cores with the Tabor machine lies in its design—featuring simplicity, compactness, handy control.

There's no need for the operator to walk back and forth in order to clamp, level, roll over and unclamp the core box. Instead, he saves valuable time. From *one position*—and with *one control lever*—he completes each operation, from clamping the plate to conveniently swinging out the drawn core.

The ingenious features in the Rollover Core Machine are good examples of the plus-values built into all Tabor foundry equipment. That's what comes of 62 years' experience in designing and building foundry machines that more than meet foundrymen's needs.

TWO SIZES:

4" Draw — for boxes up to 12" x 20" x 7"

8" Draw — for boxes up to 14" x 24" x 12"

REPRESENTATIVES
Snyder Foundry Supply Company, Los Angeles, Calif.; The Pacific Graphite Company, Inc., 40th & Linden Sts., Oakland 8, Calif.; Carl F. Miller & Company, Seattle, Washington; Harry H. Reich, Trussville, Ala.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

The TABOR *Manufacturing Co.*

SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES
6225 TACONY STREET • PHILADELPHIA 35, PENNA.

Profit with WHEELABR

- **For eliminating costly airblast rooms**
- **For high production**

Cleaning large, cumbersome castings need no longer be a slow, costly operation for you. Airless Wheelabrator Rooms have changed this picture completely making it possible to obtain a better, more hygienic job of cleaning at higher speeds and at greatly reduced cost.

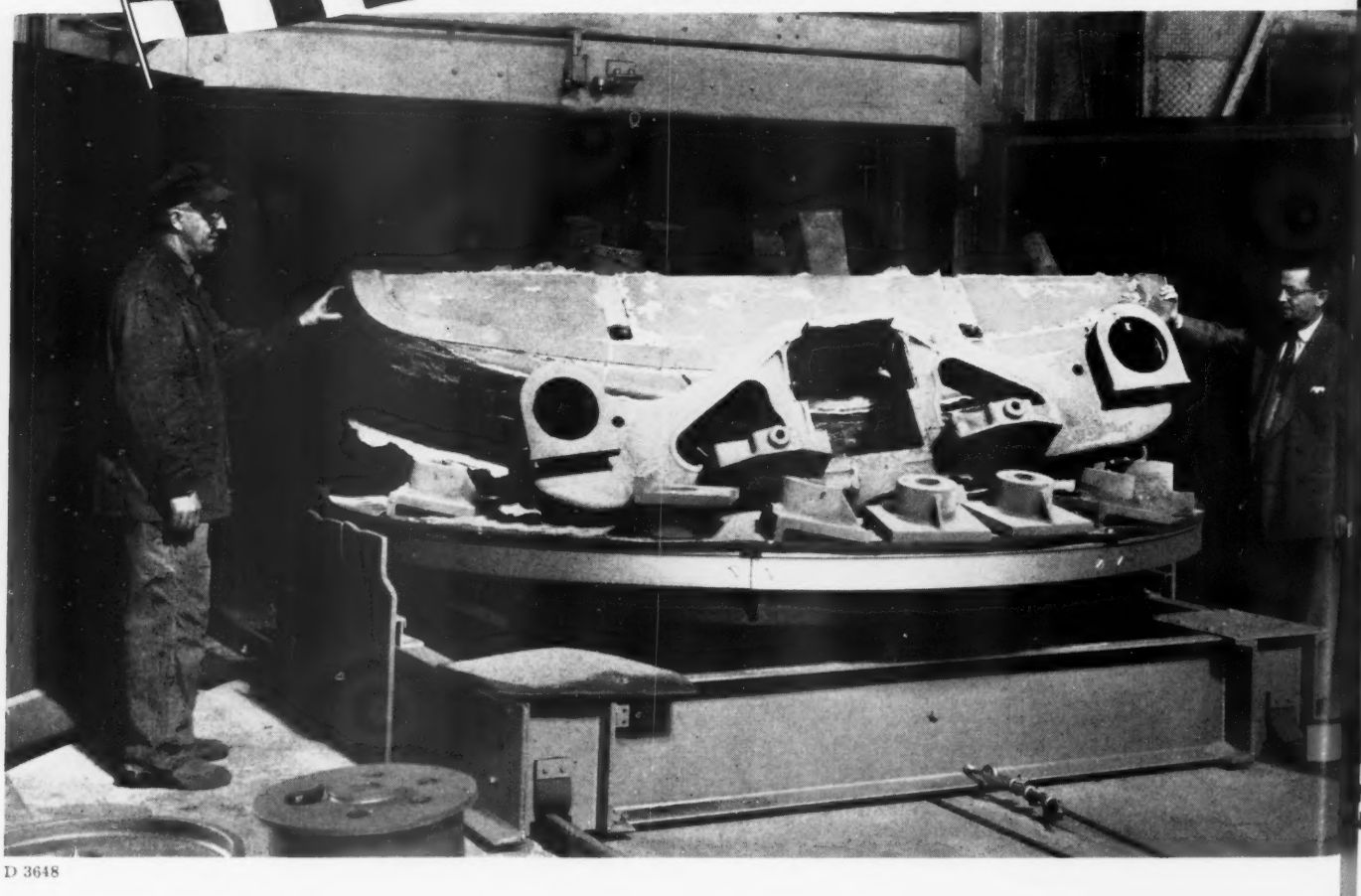
A Wheelabrator Room will clean work weighing many tons with the same efficiency, speed and thoroughness with which smaller castings are handled in standard Wheelabrator machines.

For example, American Hoist & Derrick Company reduced direct cleaning room labor 32 man hours daily in cleaning castings weighing as much as 10 tons each by replacing a large airblast room and a blast barrel with a Wheelabrator Room. Chipping and grinding costs were drastically slashed due to the improved surface cleanliness of the work.

Wheelabrator Rooms are available in many different sizes and types to meet practically any cleaning requirement. Let us tell you how you can profit with a Wheelabrator Room for your difficult cleaning problems.

setting new production records

AT AMERICAN HOIST & DERRICK COMPANY

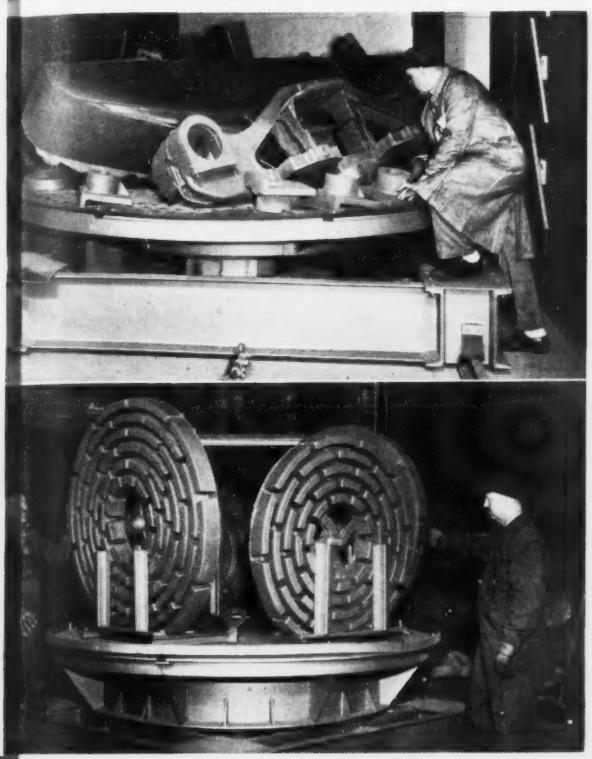


D 3648

BATOR® Rooms

- **For large bulky work**

ow cost



CLEANS 10 TON CASTINGS IN MINUTES

The Wheelabrator Car Type Room, illustrated in the top view and at the left, installed at American Hoist & Derrick Co. has a rotating work table 10' in diameter. Steel and gray iron castings weighing up to 10 tons each are cleaned in five minutes time—a small fraction of the time formerly required by airblasting.

CLEANING COSTS REDUCED 36%

Love Bros. Inc., Aurora, Illinois saved $7,310 annually on just one type of casting—a 975 lb. runner bar for a glass grinding machine—by replacing a costly, time-consuming airblast room with the Wheelabrator Room, illustrated above.

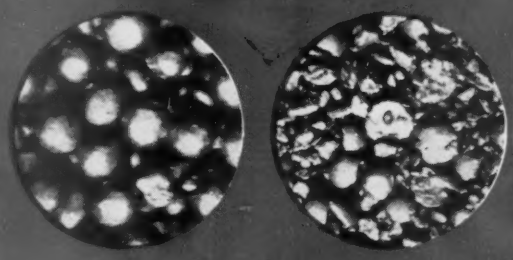
Bulletin 854 describes how Wheelabrator Rooms speed production and cut costs in cleaning large, cumbersome castings. Send for your free copy today.

NOTHER WHEELABRATOR FIRST
N DESIGN AND DEVELOPMENT

TRU-STEEL SHOT

lasts longer because it never shatters

setting new endurance records



TRU-STEEL still holds its shape after 1500 passes

CHILLED IRON as it breaks down after only 50 passes

Tru-Steel Shot lasts many hours longer than other abrasives because it does not break into millions of sharp pieces that have little cleaning value, yet abrade the wearable parts of your cleaning machine.

When CONFER, SMITH & CO., INC. switched from chilled iron to Tru-Steel they realized a $12.18 daily saving in abrasive costs.

A midwestern diesel engine manufacturer ran a comparative test between Tru-Steel and three competitive *premium* abrasives with these cost results per hour: Abrasive "A" $.67; Abrasive "B" $.978; Abrasive "C" $1.33; Tru-Steel $.467.

SAN FRANCISCO IRON FOUNDRY reported, "With Tru-Steel Shot we are experiencing less wear and maintenance on the Wheelabrator and abrasive lasts much longer."

Manufactured by Steel Shot Producers, Inc.

You can save abrasive costs . . . you save handling time . . . you save maintenance material and labor . . . when you use Tru-Steel Shot. This bulletin shows how you make these savings. Send today for your copy of Bulletin No. 37A.

THE AMERICAN MOLDER

American

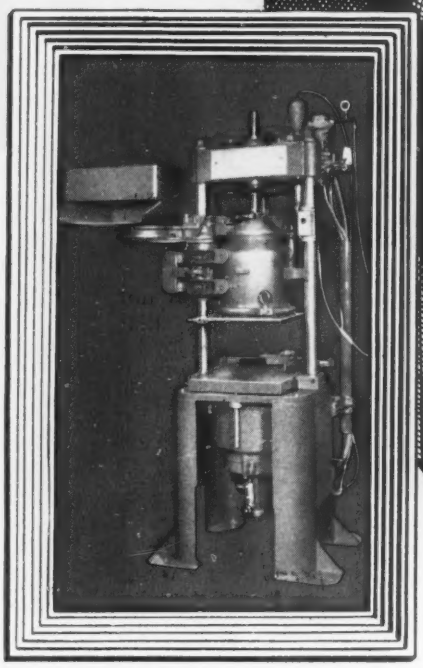
WHEELABRATOR & EQUIPMENT CORP.

505 S. Byrkit St. **Mishawaka, Indiana**

TOPS in quality and performance

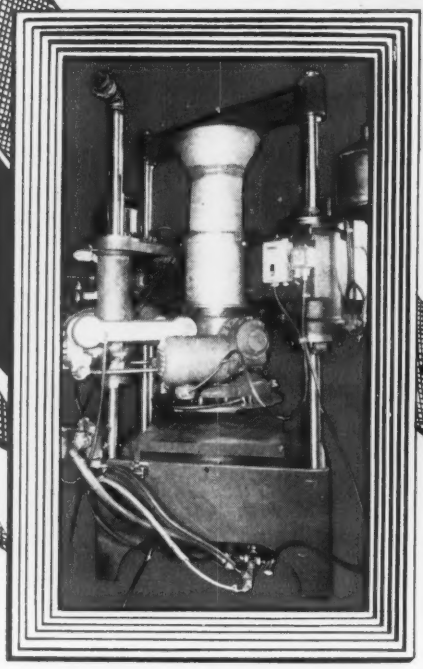
Incomparable!

SAN-BLO core and mold blowers have no equal in quality and a 'round performance, because only SAN-BLO has the "mechanized" sand magazine, with motor-driven plows and "aerating" air circu —only SAN-BLO offers "Pulsator" core blowing. These exclusi features enable you to blow *all* your sand mixtures—*all* your box (metal and *wood*), without special rigging and, in most cases, wit out venting. You can get more and more boxes *off* the bench—a blow them faster, better and more economically. If you're planni to modernize your core and mold departments, by all means inves gate SAN-BLO core and mold blowers. Phone your local FEDERA representative or write us direct for literature.



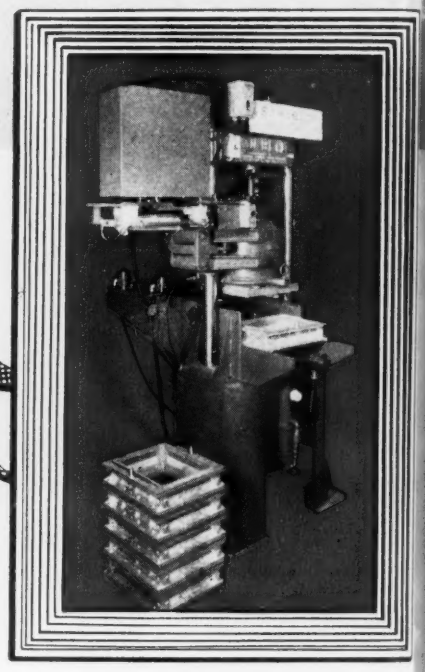
"Pulsator" Core Blower

The star of the SAN-BLO line! The Pulsator blows cores with 2, 3 or 4 quick blows, instead of one continuous blow, so that air pressure in core box is kept extremely low, making it possible to blow wooden or metal boxes without special rigging and, in most cases, without vents.



"250" Core and Mold Blower

The "big 'BLO!" Model 250 SAN-BLO, with Pulsator, produces cores weighing up to 250 lbs. each, using one standard sand magazine. Blows any sand mixture, in **WOOD** or metal boxes. Full automatic operation. Can be equipped to blow stack or cope and drag molds.

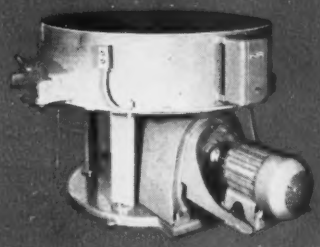


Mold Blower

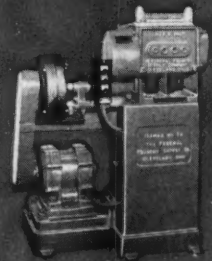
Stack or cope and drag

Sprays the patterns, blows, squeezes draws and refills automatically—all i 30 seconds. Blowing before squeez ing provides more uniform sand dis tribution, better casting surfaces Clean operation—no spilling of sand on machine and floor. Flask sizes 14x14x3 or 12x14x4.

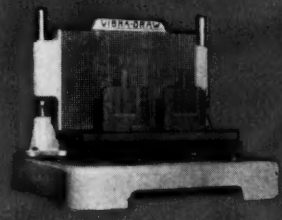
OTHER PRODUCTION-BOOSTING FOUNDRY EQUIPME



WHIRLMIX Sand Mixer



CLIMAX Wire Straightener



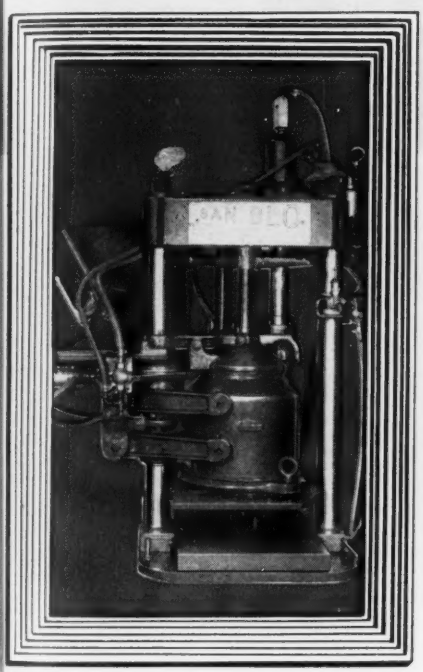
VIBRA-DRAW Core Drawer

SAN-BLO Sand Blowers

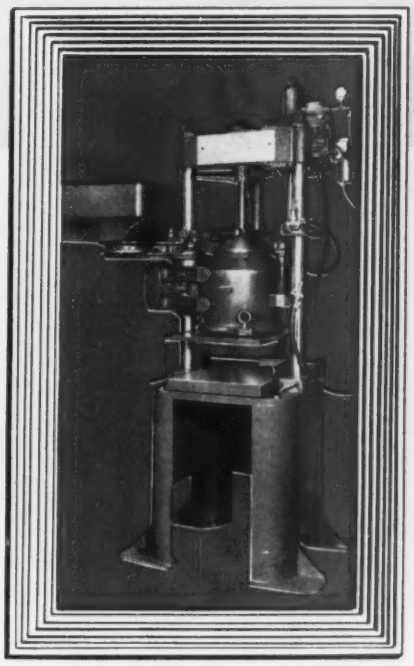
Developed, Manufactured and Sold only by

The FEDERAL FOUNDRY SUPPLY Company

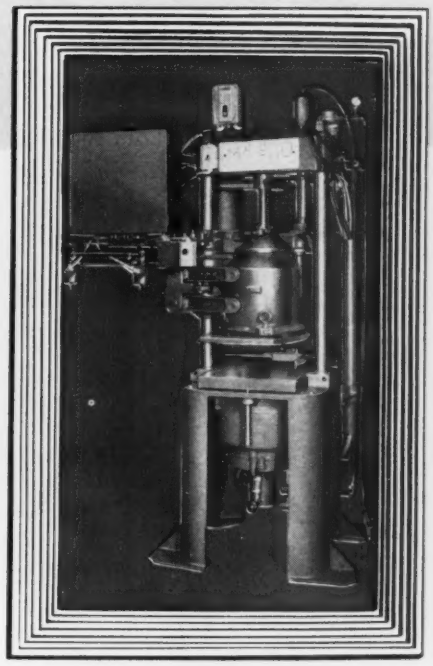
AND AUTHORIZED DISTRIBUTORS



Bench Model



Floor Model



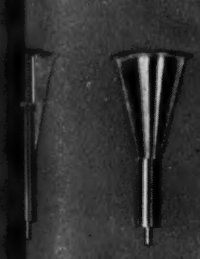
Deluxe Model

1952 STANDARD SAN-BLO CORE BLOWERS . . .

There are 10 variations of each of the above models—a total of 30 models from which to choose. They offer a wide variety of controls and features to suit every possible requirement. All machines blow cores weighing up to 40 lbs. each, with one standard sand magazine. They blow any core sand mixture, with moisture up to 8% and green strength to 12 lbs. Single control. Easily adjusted without tools. You'll get better cores, faster, more economically with a SAN-BLO!

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

. . . MADE BY FEDERAL



POT Sprues

MIJET Core Blower

FEDERAL

NEW YORK
RICHMOND, VA.
CROWN HILL, W. VA.
CHATTANOOGA
CLEVELAND

DETROIT
CHICAGO
MILWAUKEE
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THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 EAST 71st STREET • CLEVELAND 5, OHIO

WOULD YOU BELIEVE IT? *THIS* SHOT IS ANNEALED PRACTICALLY *One Pellet at a Time!*

Permabrasive annealed shot and grit is NOT annealed in batches—but is heat treated in unique fashion by a continuous process—practically heat treating a pellet at a time. Here is what this means to you:

Long abrasive life and low maintenance costs associated with the use of annealed abrasives often make this type of abrasive the most economical. Now—by a newly developed process of CONTROL—it is possible to produce annealed shot in three different and distinct hardness ranges with a narrow hardness range in each. This means that you can now buy an annealed shot in the exact hardness range to suit YOU—permits the selection of a hardness range that gives you the desired rate and degree of cleaning plus the lowest possible maintenance cost commensurate with the required degree of cleaning: by "fitting" your annealed shot to the job—you can save even more money.

Makes sense, doesn't it? And all we ask is to be permitted to determine what your exact hardness requirements are. This doesn't cost you anything—but if we're right—can save you a tidy sum of money.

Please write your name and address on the coupon below and mail it to the Hickman, Williams office nearest you. No obligation, of course. The most you can lose is a three-cent stamp.

PERMABRASIVE* SHOT AND GRIT *IS PRODUCED EXCLUSIVELY BY*

NATIONAL METAL ABRASIVE COMPANY · CLEVELAND, OHIO

AND SOLD EXCLUSIVELY BY

HICKMAN, WILLIAMS & COMPANY

(INCORPORATED)

CHICAGO · DETROIT
CINCINNATI · ST. LOUIS
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INDIANAPOLIS

OK. **You may determine our "size" in annealed abrasives, without any obligation on our part, of course.**

Name_____

Firm_____

Address_____

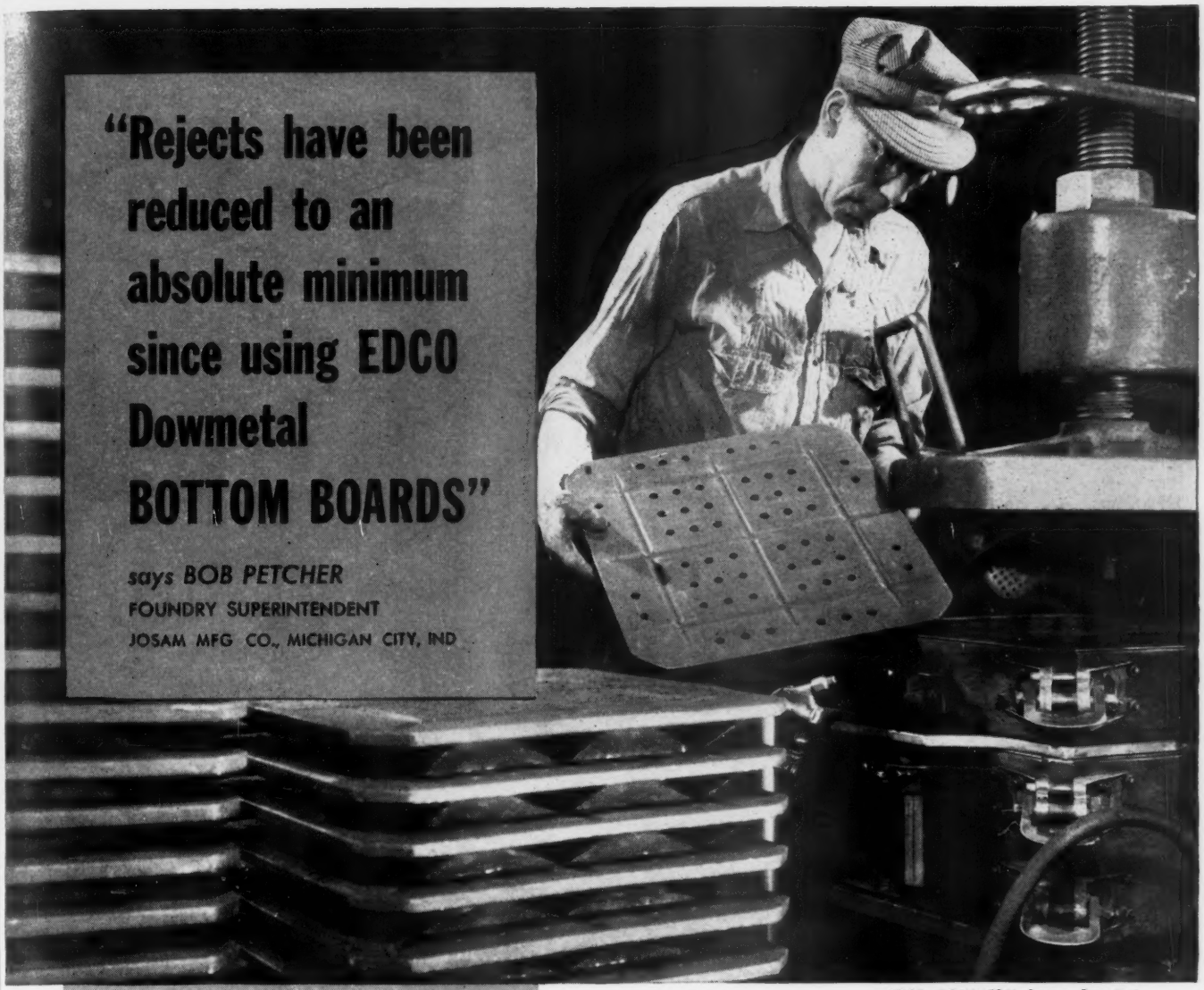
City_____

MAIL TO HICKMAN, WILLIAMS OFFICE NEAREST YOU

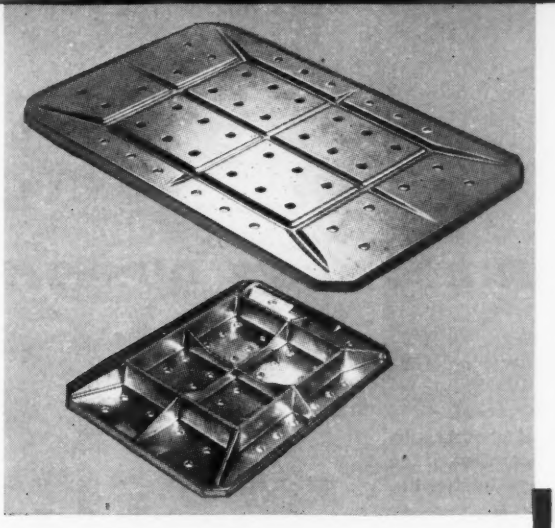
*Licensed under
U. S. Patent No. 2184926
U. S. Application No. 619602

"Rejects have been reduced to an absolute minimum since using EDCO Dowmetal BOTTOM BOARDS"

says ***BOB PETCHER***
FOUNDRY SUPERINTENDENT
JOSAM MFG CO., MICHIGAN CITY, IND



EDCO DOWMETAL Bottom Boards in use at Josam Manufacturing Company, world's largest manufacturer of plumbing drainage products



"Light, easy to handle, practically everlasting, EDCO DOWMETAL Bottom Boards have been a potent factor," says Petcher, "in improving our quality of castings and increasing our output.

"Our old wood boards had a life of about two weeks; and toward the end of their life-span, they always produced some poor castings which had to be rejected.

"EDCO Boards are just the opposite—they are *permanent equipment.* We've been using EDCO DOWMETAL Bottom Boards for more than four years—have used them almost 10,000 times—and they are still in perfect condition.

"These boards have paid for themselves many times over."

You, too, can save time, space and substantial cash sums by using EDCO DOWMETAL Bottom Boards.

They're easy to handle—light. They stack in small space, easily and securely. They last indefinitely—built for it.

Above all, like Josam, you get better castings, fewer rejects—a big saving.

Write us, or phone CApitol 7-2060 for price schedule and list of 78 standard sizes available from stock.

CHRISTIANSEN CORPORATION

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CHICAGO 51, ILLINOIS
ALUMINUM ALLOY INGOTS
ZINC BASE DIE CASTING ALLOYS

shell molding

NEW BOOKLET ANSWERS FOUNDRYMEN'S QUESTIONS

Easy to read, thorough, concise—this booklet tells about BAKELITE Phenolic Resins developed for the shell molding process for casting ferrous and non-ferrous metals.

Here you'll find helpful information about this money-saving process . . . about resin-sand mixtures for making thin shell molds . . . pattern preparation . . . mold curing . . . pouring.

These lightweight shell molds yield almost pattern-smooth castings. Tolerances are as close as .003 to .005 inches per inch. Castings are so smooth that finishing is cut to a minimum.

This booklet covers the process in a clear, factual manner. Actual photographs illustrate the steps from preparation of the resin-sand mixture to removal of the finished casting.

To learn more about the shell molding process, write for your free copy. Mail the coupon today.

Dept. ED-29, BAKELITE COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N.Y.
Please forward my free copy of booklet C-8, "BAKELITE Phenolic Resins for the Shell Molding Process."
Name _____ *Title* _____
Company _____
Street _____ *City* _____ *State* _____

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PHENOLIC RESINS
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30 East 42nd Street, New York 17, N. Y.
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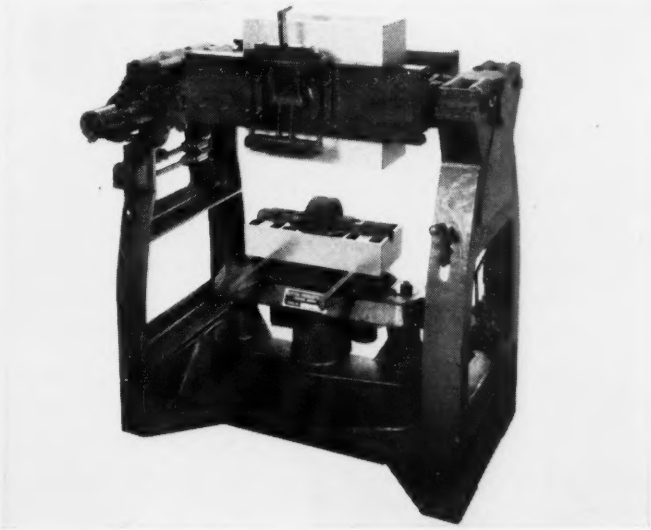
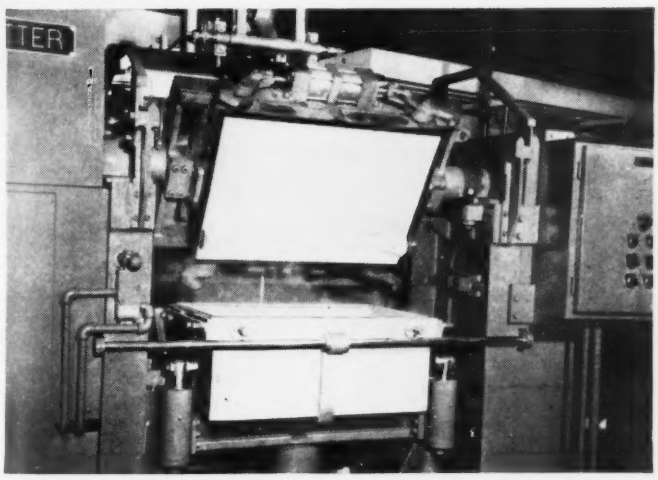
Bakelite Company (Canada) Ltd., Belleville, Ont.

three-thousand foundrymen can't be wrong!



The Sutter Core Draw Machine features powered double rollover and automatic cycle. The operator merely places the core dryer and pushes the button . . . the dryer is clamped, the core rolls over and is drawn automatically. Users report 300% increase in core production with uniform high quality from unskilled operators.



The Sutter Shell Molding Machine is a standard unit for producing shells with completely automatic cycle. The operator merely starts the cycle by pushing a button and then removes the finished shell. Complete cycle time is 33 seconds plus coating and curing time required.

We are sincerely complimented by the enthusiastic comments and interest shown by over three-thousand foundrymen who visited the demonstrations of our equipment in Atlantic City. We are doing our very best to expedite the information requested during the show as well as the inquiries that continue to come in.

Such response should serve as an indication of the cost cutting possibilities of Sutter Core Drawing Machines and Sutter Shell Molding Machines. If you could not attend and would like further information on this equipment, bulletins are available without obligation at your request. In fact a demonstration can probably be arranged for you in the foundry of some nearby user. Why not investigate today!

SUTTER

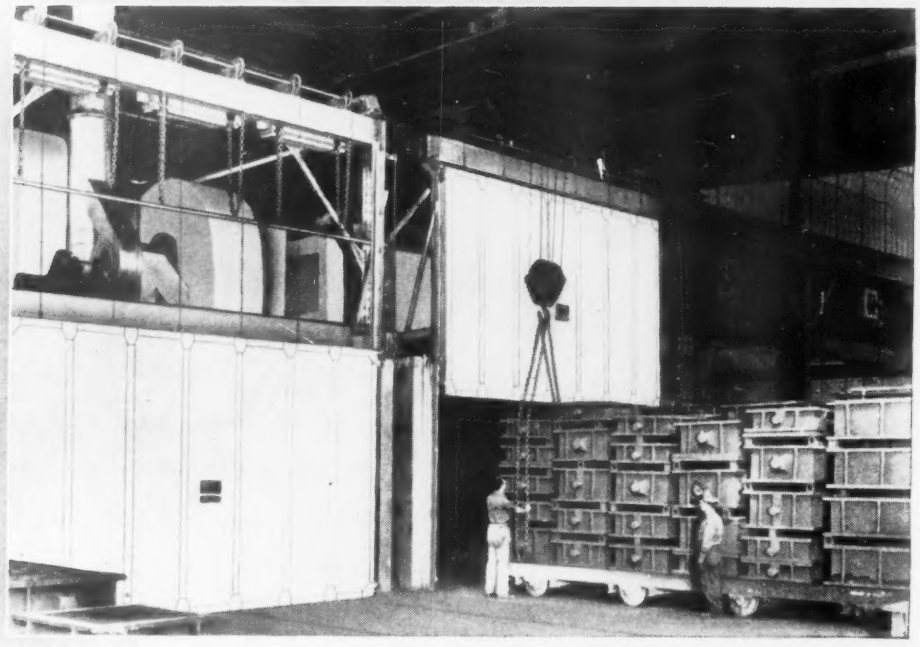
PRODUCTS COMPANY

2005 WESTWOOD AVENUE • DEARBORN, MICH.

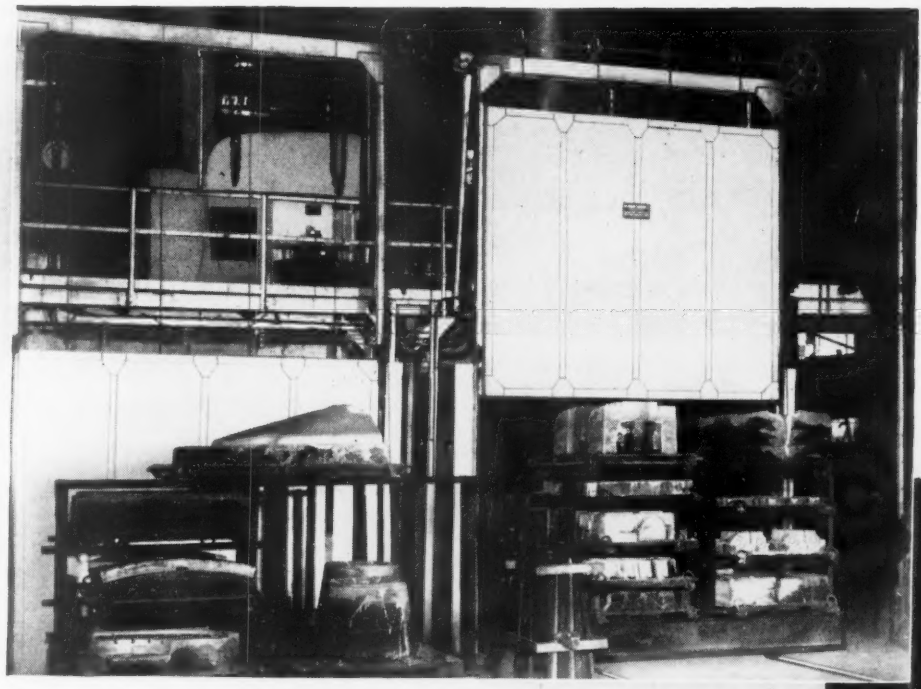
COLEMAN

FOR MORE AND BETTER

at lower cost than a



Coleman Car-Type Mold Ovens



Coleman Car-Type Core Ovens

OVENS
CORES AND MOLDS
any other method...

BAKING AND DRYING TIME REDUCED regardless of size and shape of cores and molds.

MOST EFFICIENT HANDLING METHODS for your type of work and plant conditions . . . eliminate delays and losses.

PERFECT CORE BAKING ends manpower and casting losses due to make-overs and rejects.

PERFECT MOLD DRYING for true-to-pattern castings and easy cleaning.

INCREASED PRODUCTION by making the most efficient use of skilled and unskilled labor.

HEAVY DUTY CONSTRUCTION for continuous dependable performance, economical operation, and minimum maintenance cost.

GREATEST SAVINGS IN FUEL by using the most economical fuel available.

SAVE BINDER. Proper core baking atmosphere and uniform temperature permit important savings in conventional binders.

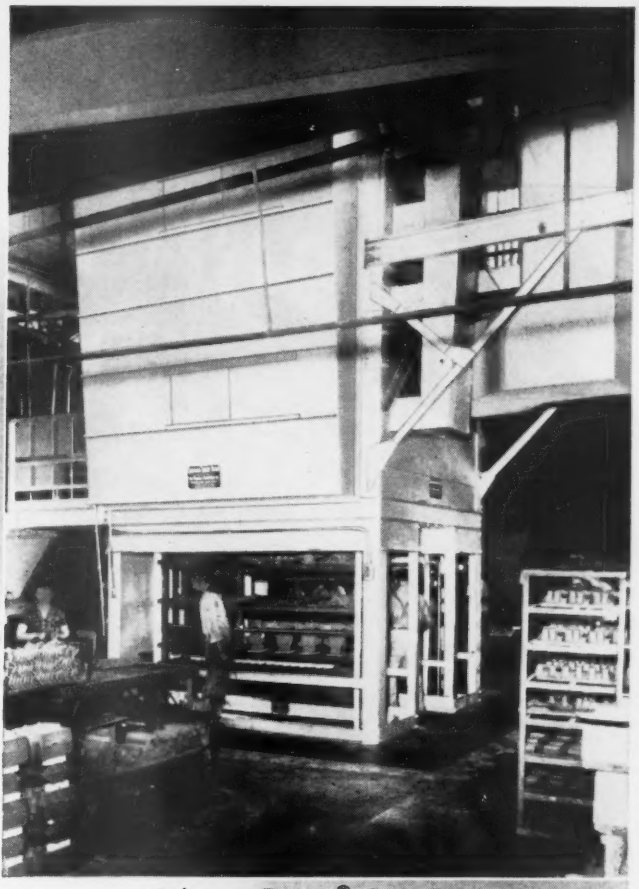
USE HIGH SPEED CORE BINDERS. Coleman ovens have uniform temperature and accurate control to handle temperature-sensitive resins and pre-baked oils.

★

A COMPLETE RANGE OF TYPES:

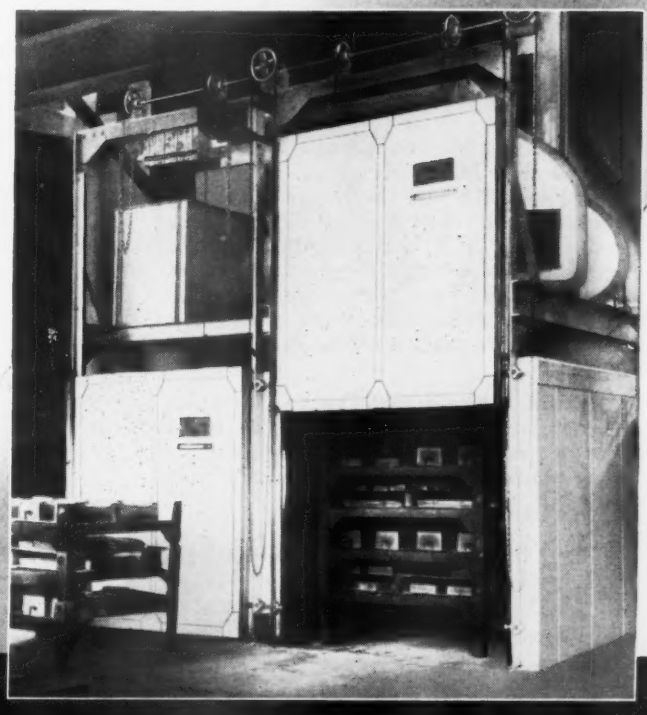
COLEMAN OVENS are built in a complete range of sizes and capacities for every core-baking and mold drying requirement: Tower Ovens, Horizontal Conveyor Ovens, Car-Type Ovens, Transrack Ovens, Rolling Drawer Ovens, Portable Core Ovens, Portable Mold Dryers, etc.

Write for Bulletin 48



Coleman Tower® Core Oven

Coleman Transrack Core Ovens



THE FOUNDRY EQUIPMENT CO.

831 COLUMBUS ROAD **CLEVELAND 13, OHIO**

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

Shock Test proves Dings new Lifting Magnet CAN TAKE IT!

PARKS IRON AND METAL COMPANY · 2755 SOUTH 34TH STREET · MILWAUKEE 15, WISCONSIN · MITCHELL 5-5535-5536

Dings Magnetic Separator Co.

Gentlemen:

...your 39" diameter lifting magnet handled our job even beyond our highest expectations.

This magnet received the roughest possible treatment for a period of six months, demolishing the gas plant in the city of Sheboygan, Wisconsin. The magnet saw daily service as a battering ram in this work plus the usual service of lifting the material and loading trucks.

We are happy to recommend your lifting magnet and assure you our next will without question be a "Dings".

Our thanks to you for producing a lifting magnet which answers the many rough handling problems confronting users today.

Yours sincerely,
PARKS IRON & METAL COMPANY
Stanley Parks
Stanley Parks

"ROUGHEST possible treatment for 6 months," says Parks Iron & Metal (right). . . . Users have been impressed with the way the Dings all-welded lifting magnet hoists a full load *all* day right up to quitting time. THAT'S BECAUSE it's cooler operating. NOW some really rugged assignments like the one at right have proven this magnet is thick skinned as well as muscled. Yet it's light. THAT'S BECAUSE the magnet is heavily reinforced *where it counts.*

Here, then, is a testimonial that any handler of metals can translate into his own profit story. Let your nearest Dings Representative give you details. Or write for the new lifting magnet bulletin —today,

DINGS MAGNETIC SEPARATOR CO.
4708 W. Electric Ave., Milwaukee 46, Wisconsin

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Associate Member,
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DINGS MAGNETS

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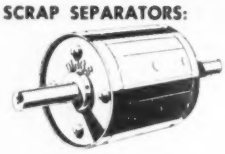
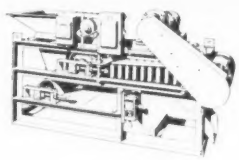


Non-Electric Drums

Electric and Non-Electric Pulleys



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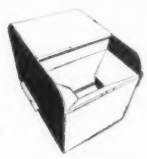

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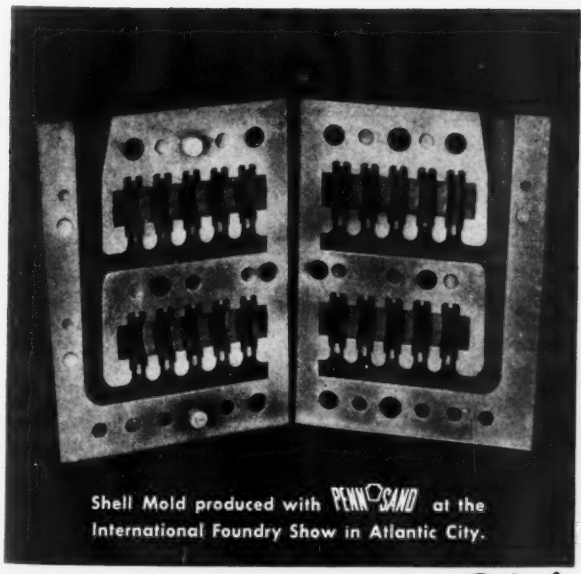
SHELL-MOLDING PENN SAND

OFFERS YOU 7 Big Advantages



Shell Mold produced with PENN SAND at the International Foundry Show in Atlantic City.

1. WIDE SCREEN DISTRIBUTION—Produces castings of exceptional finish.

2. IDEAL A.F.S. FINENESS—Cuts costs by requiring use of less resin.

3. LOW CONFINED EXPANSION—Aids mold stability, reduces rejects.

4. UNIQUE GRAIN STRUCTURE—Gives excellent permeability, eliminates gas problems.

5. HIGH REFRACTORINESS—Facilitates pouring, prevents surface defects.

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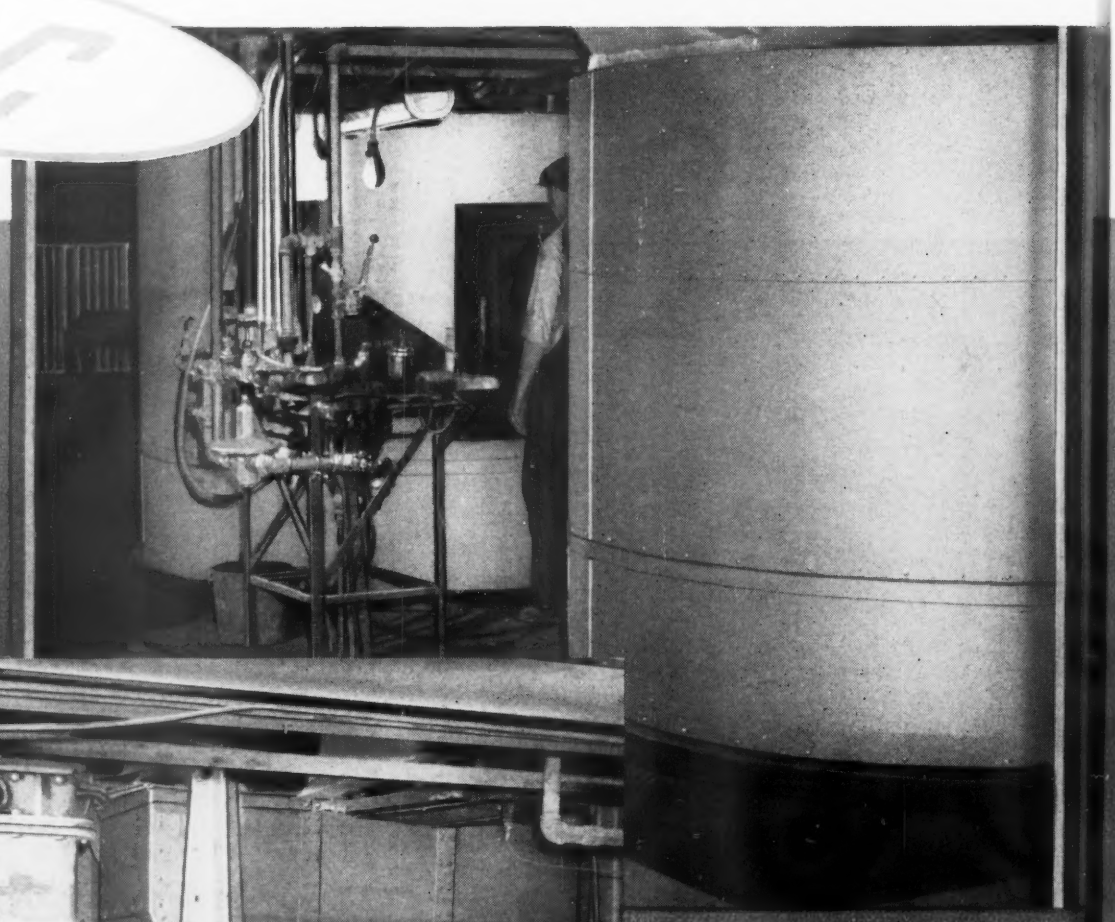
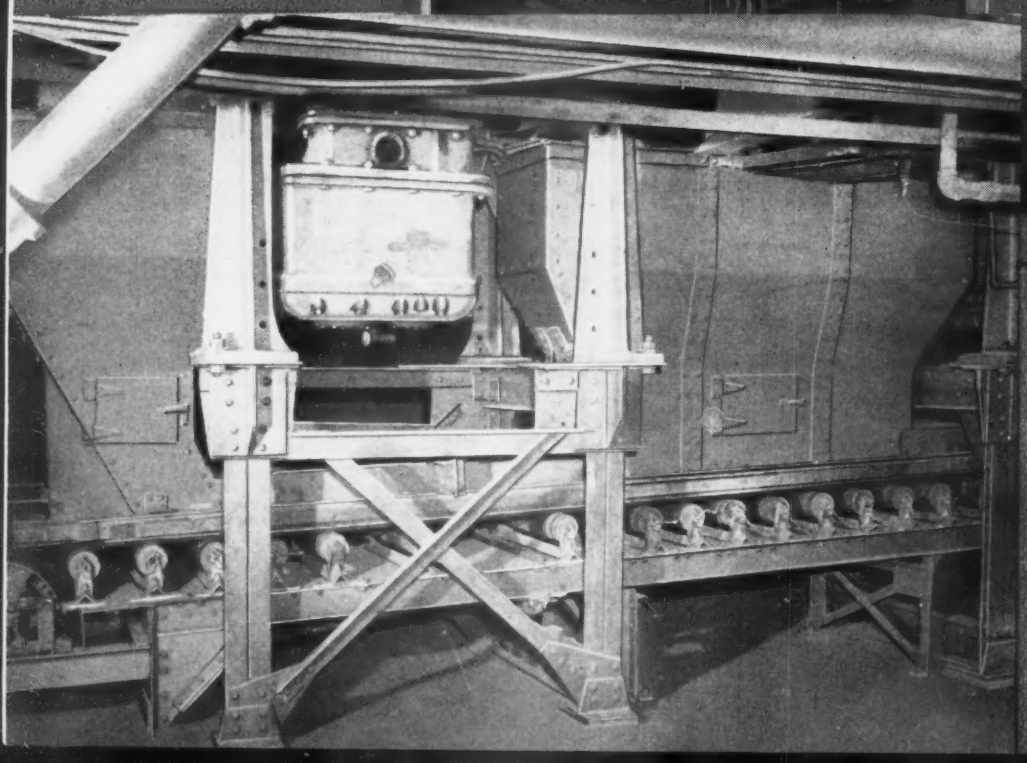
Perfect Circle

PERFECT CIRCLE CORPORATION
gets PERFECT sand for Piston Ring Molds
with 2 SIMPSON *Intensive* Mix-Mullers

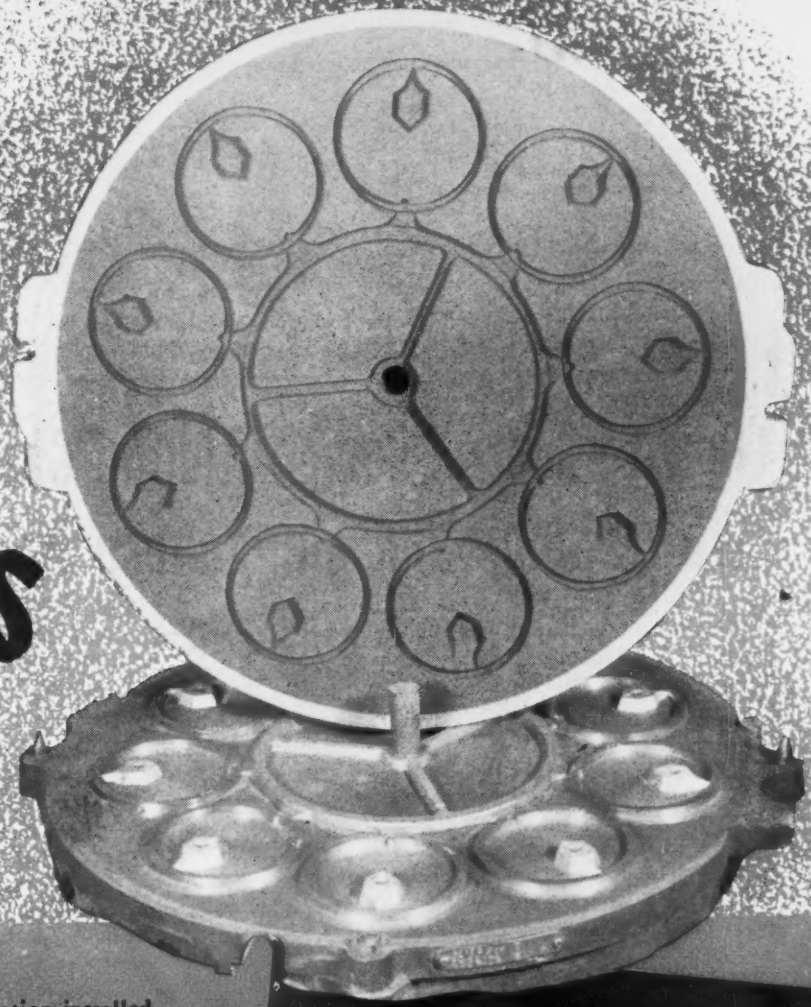


Right: Two No. 3 SIMPSON Intensive Mix-Mullers at Perfect Circle, New Castle, Indiana, turning out 90 tons/hour of carefully prepared sand.



Left: View directly below SIMPSON Intensive Mix-Mullers showing mill conveyor from which sand is elevated to distributing conveyor.

demands Perfect Castings



ELEVEN years ago the Perfect Circle Corporation installed two No. 3 SIMPSON Mix-Mullers at their New Castle, Indiana, foundry. Since the very beginning, these Mullers have consistently produced the high quality of sand so necessary to meet the rigid casting requirements of that company.

The close tolerance, the precision accuracy of Perfect Circle Piston Rings *demand* perfect castings — any defect causes a reject — even minor repairs are impossible.

Smooth, defect-free castings are only possible where molding sand is prepared with utmost care — where each sand grain is evenly coated with bond — where the moisture content is carefully controlled.

At Perfect Circle *production too* must be maintained at a high level. Here again, SIMPSON Mixers have maintained an enviable record . . . 11 years of operation *with no down time due to Mullers.*

Perfect Circle is justly proud of an efficient sand system which is operating now, as it did for 5 critical years during the war . . . 6 days a week, 22 hours a day with less than 0.05% down time per year!

Whether you are casting small piston rings or large manhole covers, the efficiency and speed of your operation — the quality of your finished product, is dependent on the preparation of your sand. Let us show you how you need not sacrifice quality to obtain top production and low maintenance with the rugged SIMPSON Mix-Muller.

Write for bulletin No. 511 on the new 2-F and 3-F *Intensive* Mullers.

Installation Highlights of two SIMPSON Intensive Mix-Mullers at Perfect Circle

- ★ Eleven years of service with no down time due to mullers.
- ★ Operating 22 hours a day 6 days a week for five consecutive years.
- ★ Presently producing 2000 tons of carefully prepared sand per day.
- ★ Only 0.4 percent make-up sand per day.

SIMPSON *Intensive* MIX-MULLERS

NATIONAL *Engineering Company*

608 Machinery Hall Bldg. • Chicago 6, Illinois

Manufacturers and Selling Agents: For Continental European Countries — George Fischer, Ltd., Schaffhausen, Switzerland; for British Possessions — August's Limited, Halifax, England; for Canada — Dominion Engineering Co., Ltd., Montreal; for Australia and New Zealand — Gibson, Battle & Co., Pty., Ltd., Sydney; for Argentina, Brazil and Uruguay Equipamentos Industriais EISA Ltda., Sao Paulo, Brazil; for Mexico — CASCO S. De R.L., Mexico, D.F.

Advertisement

ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

How to Control Composition of Cast Iron With Silicon and Manganese Briquets

Control of the composition of cupola-melted cast iron becomes a simple matter through the use of alloy briquets.

These briquets make the old practice of blending two or three pig irons of high and low silicon and manganese contents, to produce a desired composition, both unnecessary and undesirable. A single grade of pig iron can be stocked, and any desired composition in the product can be obtained, simply and economically, by the addition of silicon and manganese briquets.

Function of Silicon in Iron

In cast iron, silicon acts as a deoxidizer and graphitizer. It promotes the formation of flake graphite and softens the iron.

When either the carbon or silicon content of an iron is too low for the section thickness involved, the result will be the formation of chilled spots (iron carbide) at corners and in other rapidly cooled locations. This has an adverse effect on the machinability of the iron and the life of the tools used to machine it. On the other hand, excessively high carbon or silicon content in heavier sections results in open-grained iron that is both soft and weak.

How Silicon Aids Carbon Control

A rather definite relationship exists between the silicon level in a pig iron and its carbon content, as shown in Figure 1.

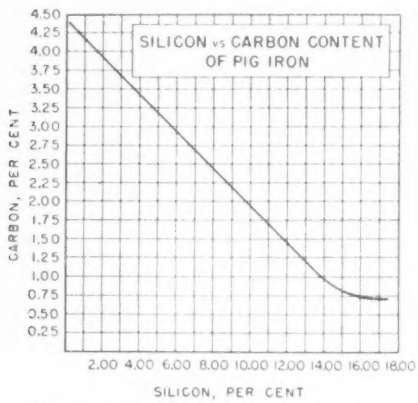


Fig. 1—Relation of silicon and carbon content in pig iron. Notice that the carbon level gradually decreases as the silicon is increased.

As indicated in Figure 1, an increase in the silicon content of a pig iron has a decided effect in lowering its carbon content. When producing soft iron, where it is desirable to hold the carbon on the high side, pig iron running in the range of 2.0 per cent silicon is desirable in the cupola charge, rather than the higher silicon grades of pig sometimes used in these irons. The additional silicon needed to meet the desired chemical analysis can be easily and economically added to the charge in the form of silicon briquets. This provides an economical and flexible system of chemical control.

Function of Manganese in Iron

Manganese acts as a scavenger to deoxidize iron. As an alloying element, it imparts density and high strength. It combines with sulphur to form manganese sulphide, which does not have the harmful characteristics of the iron-sulphide inclusions that form when manganese is not present. A manganese-sulphur ratio of 6:1 is suggested.

Briquets Give High Alloy Recovery

Silicon and manganese briquets are manufactured by ELECTROMET in the sizes shown in Table I. These "EM" briquets are all made with a binder that prevents oxidation until the alloy unites with the iron in the melting zone of the cupola. Thus, the recovery of alloy is high—usually over 90 per cent for silicon and about 85 per cent for manganese.

Booklet Available

Further information is given in our booklet, "Briquetted Alloys For The Iron Foundry Industry." This booklet contains information about "EM" briquets of silicon, silicomanganese, ferromanganese, and chromium. To obtain a copy, free of charge, write or phone our nearest office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

The terms "EM" and "Electromet" are registered trade-marks of Union Carbide and Carbon Corporation.

Table I. "EM" Briquetted Alloys for Cupola Additions

Type of Briquet	Gross Weight	Alloy Content
"EM" Silicon Briquets (two sizes) Round	5 lb.	2 lb. Silicon
	2½ lb.	1 lb. Silicon
"EM" Silicomanganese Briquets Square	3½ lb.	½ lb. Silicon 2 lb. Manganese
"EM" Ferromanganese Briquets Oblong	3 lb.	2 lb. Manganese

Table II. Typical Briquet Mixture for Soft Gray Iron

Base Charge			Alloys in Charge Material			
			Silicon		Manganese	
Per Cent	Lb.	Material Charged	Per Cent	Lb.	Per Cent	Lb.
40.0	400	Pig Iron	2.25	9.00	0.75	3.00
40.0	400	Return Scrap	2.50	10.00	0.65	2.60
20.0	200	Purchased Scrap	2.28	4.56	0.55	1.10
100.0%	1,000 lb.	Total Base Charge		23.56		6.70
Briquets Required		4 Small Silicon Briquets		4.00		—
		½ Silicomanganese Briquet		0.25		1.00
		Total Alloys Charged		27.81 lb. Si or 2.78% Si		7.70 lb. Mn or 0.77% Mn
		Melting Recovery Factor		x .90		x .85
		Final Analysis of Iron		2.50% Si		0.65% Mn

Simple Solution

to a Purchasing Problem—

ORTAC hose that answers most of your needs!

THERE'S a simple answer to hose purchasing problems—Goodyear's ORTAC *(Oil Resistant Tube and Cover)*. For this ONE construction was designed by the G.T.M.—Goodyear Technical Man—to handle MANY jobs.

ORTAC will withstand gasoline, fuel oils and distillates. It resists attack from solvents. Contaminants found in water don't harm it. ORTAC is excellent too for air and spray service. Its cover resists sun, weather and wear—and ORTAC has a tube that won't flake, swell or discolor.

Ask your nearest distributor for the full story of ORTAC—or write Goodyear, Akron 16, Ohio.

GOODYEAR INDUSTRIAL RUBBER PRODUCTS
GTM - Specified ORTAC HOSE
for UNIVERSAL USE
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B Braids of high-strength rayon cord
C Cover resists weather, oil, sun, abrasion

LOOK FOR YOUR GOODYEAR INDUSTRIAL RUBBER PRODUCTS DISTRIBUTOR *in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods." He handles Hose, Flat Belts, V-Belts, Molded Goods, Packing, Tank Lining, Rubber-Covered Rolls built to the world's highest standard of quality.*

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When you buy shot and grit, you buy a promise of uniform, low cost, efficient blast cleaning or peening. Your confidence in the material ordered should be based on actual use, rather than recommendation or reputation. Its true value to you can only be determined by a thorough test in your equipment, on your job.

To all outward appearances, most shot and grit may appear to be the same—but, that's where the similarity ends. Where Hi-Grade Shot and Grit are concerned, you'll find there IS a difference . . . a value far beyond purchase price that pays out in extra performance on *your* job. Hi-Grade Shot and Grit is *quality-controlled* from molten metal to finished product. Order a trial quantity today. Let results convince you *Hi-Grade is best by test.* That's the only practical and profitable way to buy abrasives.

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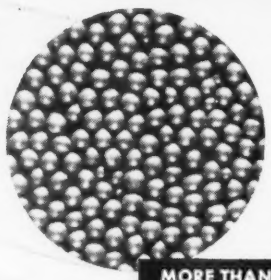

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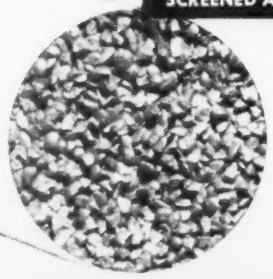
SCREENED AND GRADED FOR 100% USAGE



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Made of same material and processed by same methods as Hi-Grade Shot. Free from dust fines and scale. Cleans with maximum efficiency. Easy on equipment—reduces wear and maintenance costs.

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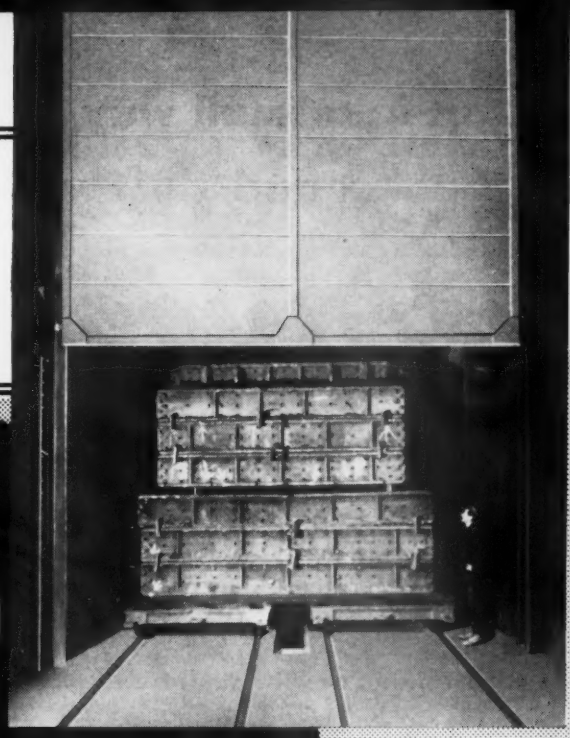

CARL-MAYER MOLD OVEN at Union Steel Castings Div. of Blaw-Knox Company.

Door clearance: 17'-9" wide, 15' high. Depth: 40'. Capacity: 200 tons per bake. Combination Gas-Oil fired.

CARL-MAYER

MOLD OVENS

•

HORIZONTAL CONVEYOR CORE OVENS

•

VERTICAL CORE OVENS

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RACK TYPE CORE OVENS

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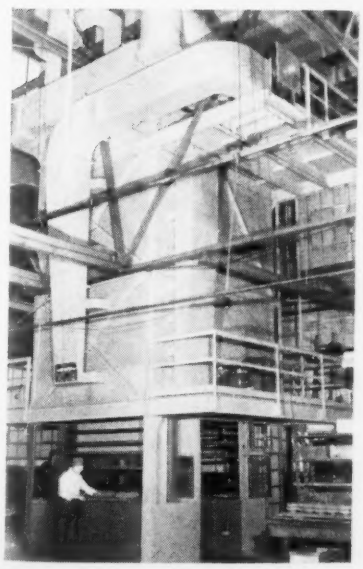
ROLLING DRAWER CORE OVENS

Engineering is what counts!

Designs have originated here for the most efficient foundry ovens.

CARL-MAYER RACK TYPE OVENS at Golden Foundry Company.



CARL-MAYER VERTICAL CORE OVENS at G. & C. Foundry Company.

Carl-Mayer installations speak for themselves. They are chosen repeatedly in face of wide competition.

Contact us on your next core baking and mold drying problem.

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WE ALSO BUILD OTHER TYPES OF INDUSTRIAL OVENS AND FURNACES.

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Write for Bulletins No. 141 and 350.

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CARL-MAYER CORE AND MOLD OVENS ARE SERVING CONCERNS LIKE THESE:

Aluminum Co. of America
American Brake Shoe Co.
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Dunkirk Radiator Co.
Eclipse Aviation Division of Bendix Aviation Corp.
Electric Autolite Co.
Ford Motor Co.
Fremont Foundry Co.
G. & C. Foundry Co.
General Electric Co.
General Motors Corp. and Subsidiaries
Gilbert & Barker Co.
General Steel Castings Co.
Golden Foundry Co., Inc.
Henry Kaiser Corp.
W. O. Larson Foundry Co.
Mesta Machine Co.
F. E. Meyers & Bro. Co.
Oil Well Supply Co. (U. S. Steel Corp.)
Packard Motor Car Co.,
Pittsburgh Steel Foundry Corp.
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Standard Foundry Co.
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Union Steel Castings Co.
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3030 Euclid Ave., Cleveland, Ohio

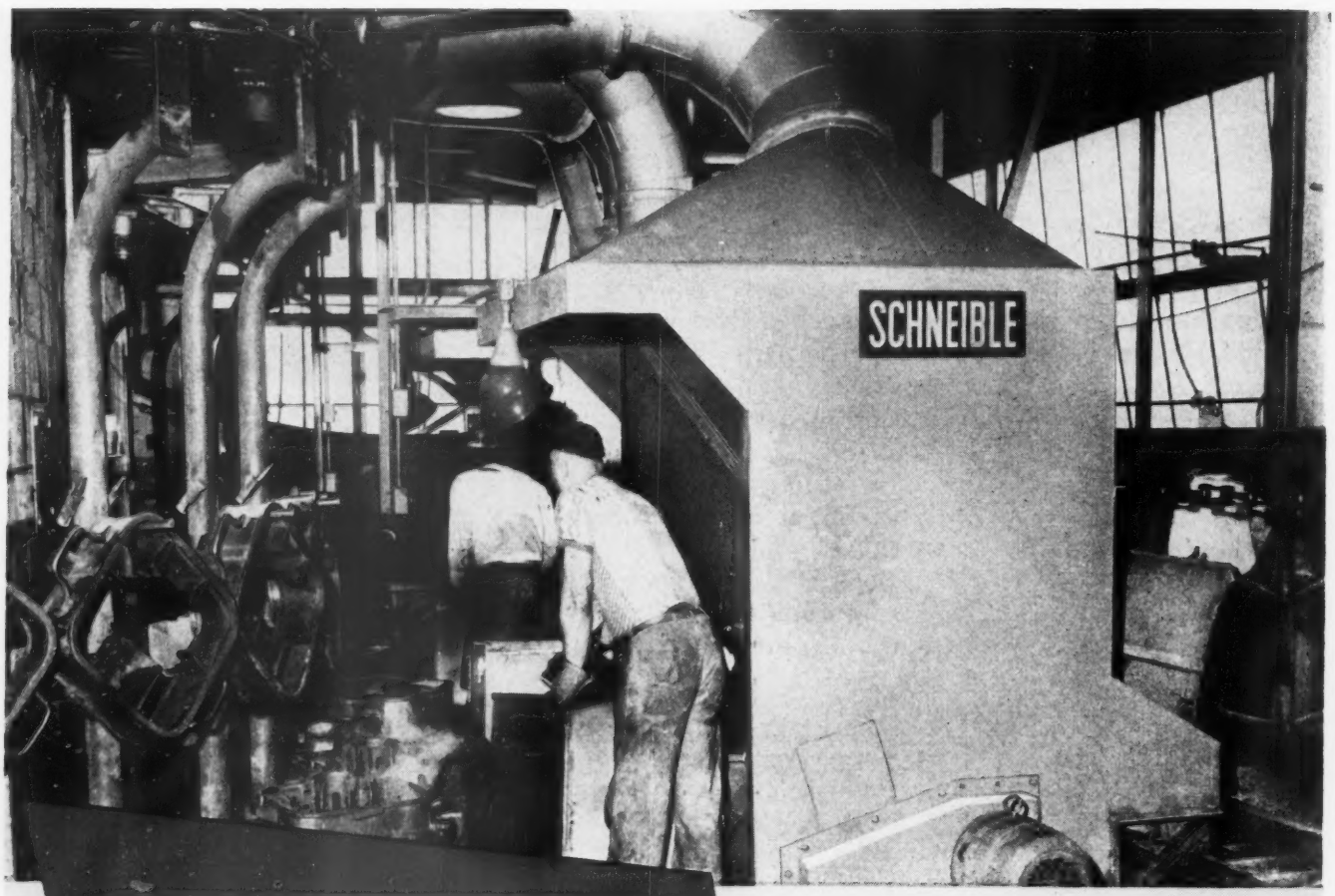
Backed by reputation and over 30 years' experience

You can start in a small way—to clean up smoke and dust with

MULTI-WASH

If you have one department that is obnoxious, there's a Multi-Wash application that will efficiently clean-up that smoke and dust nuisance. ¶ The type JC Multi-Wash collector is designed for just such a situation. There's no need to plan an extensive program and outlay of capital for complete foundry dust and fume control when you can start small and build your system as conditions warrant. ¶ Why not check with your local Schneible representative on a Multi-Wash system that will suit your needs, or write direct for complete information.

CLAUDE B. SCHNEIBLE CO.
P. O. BOX 81, NORTH END STATION
DETROIT 2, MICHIGAN



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Late Foundry News

JUNE 25, 1952

MALLEABLE FOUNDERS ELECT: Frank D. Brisse, president, Laconia Malleable Iron Co., Laconia, N. H., was elected president of the Malleable Founders' Society at the latter's annual meeting, June 16-17. George T. Boli, president, Northern Malleable Iron Co., St. Paul, was named vice president. The society's McCrea Medal, awarded annually for outstanding service to the industry, was presented to Ralph N. Cole, president, Canton Malleable Iron Co., Canton, O.

INDUSTRIAL EXPANSION: Most proposed heavy industrial plant expansion has been started or is on its way to completion, although considerable work remains to be done. As of June 5 DPA had approved accelerated tax amortization for nearly 11,000 new or expanded facilities representing almost $20 billion. Awaiting action were applications involving more than $7 billion. Certificates of necessity approved as of Apr. 1 included approximately $100 million for 263 foundries. Nearly $25 million is involved in pending applications from 87 foundries. A recent ruling by DPA is that no more individual expansions requiring tax amortization will be considered by Washington without prior consultation with the government.

NEW APPROVALS: Latest lists of approved certificates of necessity include $50,500 for Ajax Foundry Inc., Randolph, Mass., $149,063 for Adirondack Foundries & Steel Inc., Watervliet, N. Y., and $330,026 for Wehr Steel Co., Milwaukee.

PRESS CASTINGS: Plans to buy in Europe the large steel castings required for the huge presses to be built for the Air Force have been revised. U. S. foundries are to be given a chance to bid on the work first. Blueprints and specifications for the castings are available for inspection at the office of Col. W. R. Carter, Wright-Patterson Air Base, Dayton, O. Involved are about 200 castings weighing from 1275 to 353,000 pounds. Most of them are on the heavy side. Orders for the castings will be placed by the press builders—Baldwin-Lima-Hamilton Corp., E. W. Bliss Co., Loewy Construction Co. and Lombard Mfg. Co. The last-named is a subcontractor.

MORE METALS: In line with the easier supply situation in various metals, NPA has substantially increased the amount of copper and aluminum consumers may buy in the third quarter by self-certification. This will also eliminate considerable paper work as many buyers no longer have to file applications for their needs.

COPPER FREER: Tightness in copper supply is being eased somewhat with increased allotments of about 50,000 tons during third quarter. It results from a decline in world copper prices and government permission for United States producers to pass on to consumers 80 per cent of the differential between foreign and domestic prices. Allotments to some consumer goods manufacturers in third quarter are increased from 35 per cent of their 1950 base use to 50 per cent.

ARSENAL TRANSFER: Management of the Ordnance Department's Detroit Arsenal, incorporating an experimental foundry, is being transferred to the Chrysler Corp. The foundry, equipped with two electric furnaces, produced ferrous and nonferrous castings, largely on development work.

CASTINGS ALLOCATION: A directive to be issued by NPA will authorize allocation of steel castings for seven quarters ahead, starting with the fourth quarter this year. This will permit steel foundries to book orders with definite delivery dates, and is intended to give a better picture of open spots in production schedules. NPA hopes the system will enable it to better determine the industry's production capacity by types and sizes of castings.

WOMEN IN FOUNDRIES: A study by the Bureau of Labor Statistics shows that iron and steel foundries employed 12,300 women as of December, 1951. This was 4 per cent of total employees. Nonferrous foundries had 14,800 women workers, 13 per cent of their total.

SMALL MANUFACTURERS: Small Defense Plants Administration is urging small manufacturers desiring defense contracts or subcontracts to list their plant facilities with SDPA field offices. The latter are preparing lists for use by procurement specialists to assist small plants to obtain defense and other procurement contracts and also orders on a subcontract basis.

CEILING CHANGES: Settlement of the steel strike will mean revisions in ceiling price regulations applying to iron and steel manufactured products, including castings. Increases will be required to compensate for higher prices on pig iron as well as for what wage boosts result.

SCRAP SUPPLY: The NPA order which stimulated scrapping operations by auto wreckers has been discontinued. This reflects the improved scrap supply, particularly in motor blocks, a situation partly due to the lower consumption by foundries.

PERSONALS: Ralph L. Wilson, director of metallurgy, Timken Steel & Tubes Division, Timken Roller Bearing Co., Canton, O., has been nominated for presidency of the American Society for

Metals. Vice presidential nominee is J. B. Austin, director of Research Laboratories, U. S. Steel Co., Kearney, N. J. . . . John C. Kinnear Sr., former vice president of Kennecott Copper Corp. and currently assistant to the director of ODM, has been appointed United States representative to the Copper-Zinc-Lead Committee of the International Materials Conference . . . James O. Wright has been elected president and William C. Wright vice president of Badger Meter Mfg. Co., Milwaukee.

MOBILE FOUNDRY: Military Supply and Procurement Division of the Corps of Engineers, Washington, is planning to buy a mobile foundry unit. It will be installed at Ft. Belvoir, Va. After trial operation there specifications will be drawn up as a basis for the purchase of a number of additional units.

MORE ACCIDENTS: Foundries show up poorly in the 1951 report of the National Safety Council. Among 40 basic industry classifications only seven groups had a higher accident rate than the castings industry. Frequency of accidents in foundries last year was 16.21 disabling injuries per million man-hours. This was a 23 per cent increase over 1950 and compares with an average of 9.06 for all industries. Rate for the steel industry was 4.5. However, the severity of foundry accidents has lessened; the 1951 index of 1.29 compares with 1.40 in 1950, 1.43 in 1949 and 1.74 in 1948.

MISCELLANY: Because of the steel strike International Harvester Co. will shut down its Milwaukee works completely July 3 . . . Price of ethyl silicate, condensed, widely used in precision investment casting production, has been reduced 15 per cent by Carbide & Carbon Chemicals Co. . . . Hills-McCanna Co., Chicago, will close its magnesium foundry July 12 to 27 to install new facilities that will approximately triple the plant's capacity . . . Solvay Process Division, Allied Chemical & Dye Corp. recently completed its new soda ash manufacturing plant at Syracuse, N. Y., part of a $20 million expansion program begun there in 1945 . . . Resistance against the exchange of information within industries gradually is being eliminated in western Europe, according to Ralph R. West, president, West Steel Casting Co., Cleveland, who recently served the Mutual Security Agency six months as a foundry technical adviser in France.

PRICES OF FOUNDRY METALS AND COKE

(As of June 25, 1952)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$17.00-18.00
New River	21.30
Wise County	15.95
OVEN	
Birmingham	$20.30
Chicago	23.00
Detroit	24.00
Erie, Pa.	23.50
Everett, Mass.	24.80
Indianapolis	22.75
Kearney, N. J.	22.75
Milwaukee	23.75
Painesville, O.	24.00
Philadelphia	22.70
Neville Island (Pittsburgh)	23.00
Portsmouth, O.	22.50
St. Louis (delivered)	25.40
Swedeland, Pa.	22.60
Terre Haute, Ind.	22.50

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$54.50	$55.00
Birmingham	48.88	....
Buffalo	52.50	53.00
Chicago	52.50	52.50
Cleveland	52.50	52.50
Everett, Mass.	57.50	58.00
Fontana, Calif.	58.50	....
Geneva, Utah	52.50	....
Granite City, Ill.	54.50	54.90
Lone Star, Tex.	48.50	48.50
Neville Island (Pittsburgh)	52.50	52.50
Steelton, Pa.	54.50	55.00
Swedeland, Pa.	56.50	57.00
Toledo, O.	52.50	52.50
Troy, N. Y.	54.50	55.00
Youngstown, O.	52.50	52.50

NONFERROUS INGOT

BRASS AND BRONZE: 85-5-5-5—27.25c; 88-10-2—40.00c; 80-10-10 — 33.00c; No. 1 yellow — 23.25c.

ALUMINUM: 99 per cent plus, primary ingots 19.00c. Secondary No. 12 alloy 19.50c Deoxidizing grades: No. 1 18.80c; No. 4 18.20c.

MAGNESIUM: 99.8 per cent standard ingots 24.50c, f.o.b. Freeport, Tex.

COPPER: Electrolytic 24.50c, Connecticut valley; Lake 24.61½c, delivered.

Zinc: High grade 16.35c, delivered. Die casting alloy 19.50c, delivered.

IRON AND STEEL SCRAP

(Ceiling prices per gross ton as established by the Office of Price Stabilization)

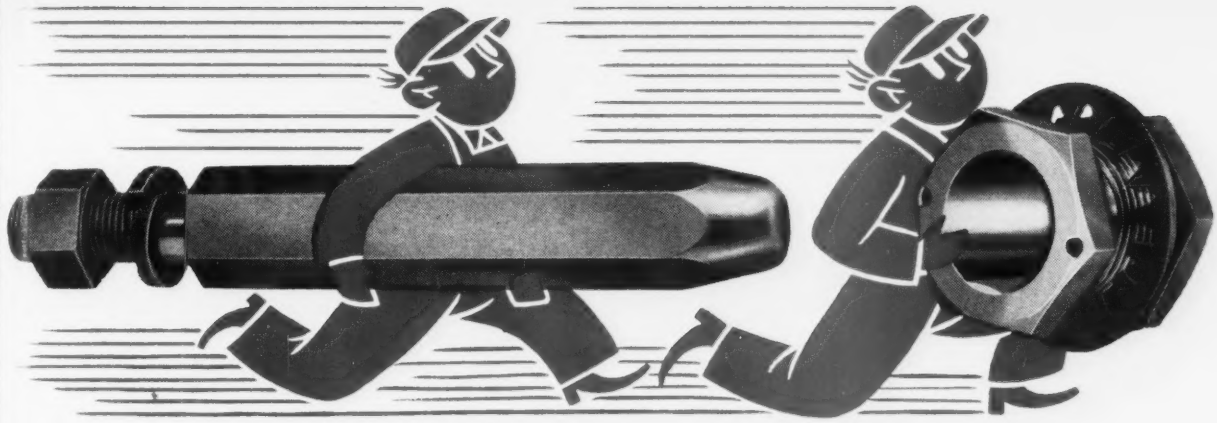
	*No. 1 Bundles	Cast Steel	**Steel, 2 ft & less	Punchings, Plate Scrap	Cast Iron Briquets
Birmingham	$39.00	$44.00	$39.00	$41.50	$39.00
Buffalo	43.00	48.00	43.00	45.50	43.00
Chicago	42.50	47.50	42.50	45.00	42.50
Cincinnati	43.00	48.00	43.00	45.50	43.00
Cleveland	43.00	48.00	43.00	45.50	43.00
Detroit	41.15	46.15	41.15	43.65	41.15
Eastern Pa.	42.50	47.50	42.50	45.00	42.50
Los Angeles	35.00	40.00	35.00	37.50	35.00
Pittsburgh	44.00	49.00	44.00	46.50	44.00
San Francisco	35.00	39.00	35.00	37.50	35.00
St. Louis	41.00	46.00	41.00	43.50	41.00
Seattle	35.00	40.00	35.00	37.50	35.00

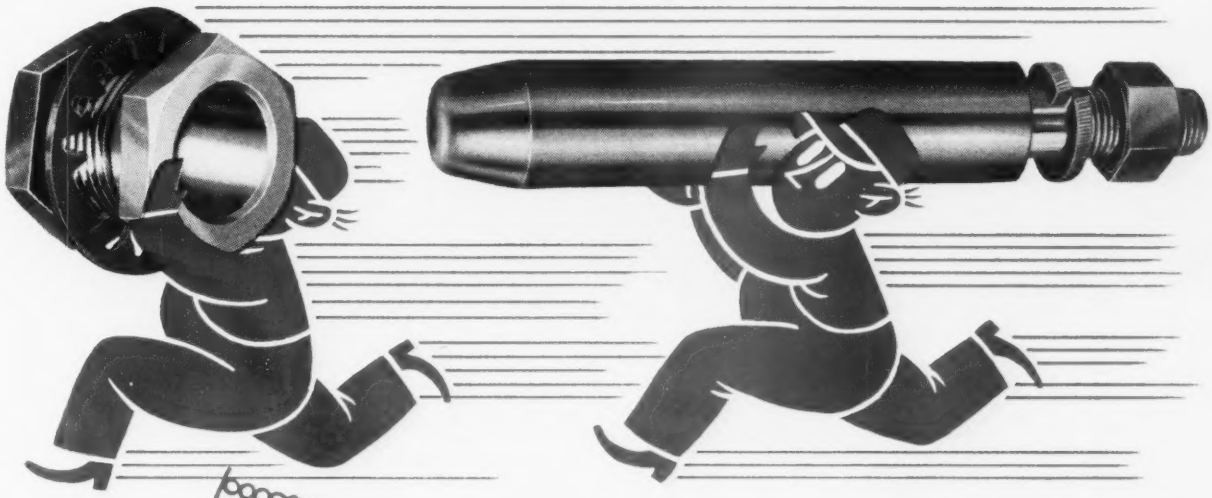
Above delivered prices are ceiling levels at basing points indicated. * Applies to dealer and industrial scrap; No. 1 and No. 2 heavy melting steel are $1 less; No. 1 railroad heavy melting is $2 higher. **$2 higher if 1 ft or under.

CAST IRON SCRAP

No. 1 cupola cast	$49.00
Heavy breakable cast	45.00
Burnt cast iron	41.00
Cast iron brake shoes	41.00
Stove plate	46.00
Clean auto cast	52.00
Unstripped motor blocks	43.00
Iron wheels, No. 1	47.00
Malleable	55.00
Drop broken machinery cast	52.00

Above ceiling prices, per gross ton, are f.o.b. shipping point. Add transportation charges to obtain delivered prices at any foundry.



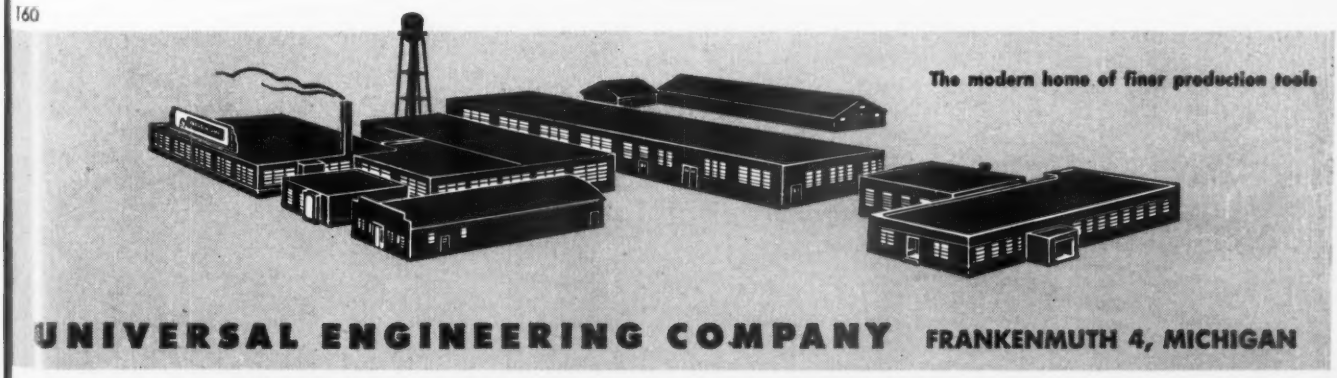


YOU SAVE TIME WITH UNIVERSAL

THREADED FLASK PINS AND BUSHINGS

Universal Flask Pins and Bushings save precious minutes of production time because they assure instant, accurate alignment of cope and drag. And they also save down-time because, being heat-treated and precision ground from fine quality steels, they stand up under rough treatment and give long, satisfactory service. Universal threaded series Flask Pins and Bushings are used in steel, aluminum, magnesium or other light metal flasks. Bushings are available in both the round and elongated types; pins in both round and hexagonal types. Universal carries a complete line of sizes of its threaded series as well as its taper and plain series Pins and Bushings as regular stock items. For further information write to the Universal Warehouse nearest you — 1060 Broad St., Newark, N. J., 5035 Sixth Ave., Kenosha, Wisc., or the home office.

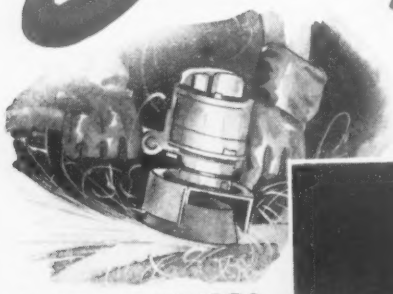
160



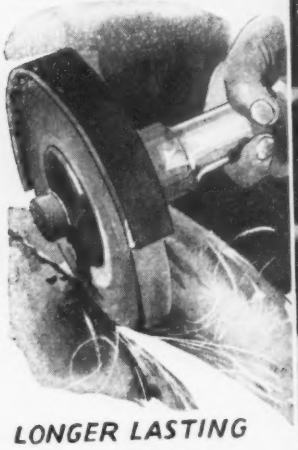
UNIVERSAL ENGINEERING COMPANY FRANKENMUTH 4, MICHIGAN

STERLING-THE BETTE
PORTABLE GRINDIN

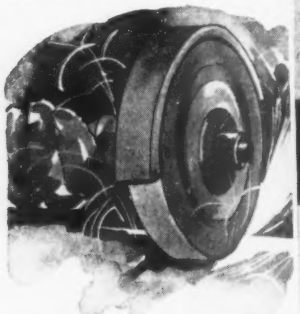
TAILOR MADE



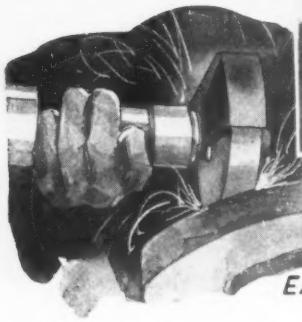
CORRECT SHAPES



LONGER LASTING



HIGHEST QUALITY



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STERLING
GRINDING WHEELS

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ABRASIVE PRODUCTS
FOR
• BETTER GRINDING
• FASTER GRINDING
• LOW COST GRINDIN

THE STERLING GRINDIN
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ND FASTER WAY TO DO
T THE LOWEST POSSIBLE COST!

These superior, high-speed "Wheels of Industry" combine special bonds and abrasive grains to provide efficient, economical grinding of castings.

Sterling's F or P Bonds, with special, hard, sharp abrasive grains in proper sizes, offer proper specifications for better portable grinding of gates, risers and fins, welds, pipe, bar stock, sheet metal, billets, etc.

Sterling Portable, High-Speed, Resinoid Grinding Wheels handle easily on the job . . . they do the work, not the operator! There is no need to "bear down" to get better production . . . these wheels are carefully built to accomplish much in a shorter time without operator fatigue.

Try them before you buy them! A test run, under conditions you select, will readily prove the natural superiority of these Sterling wheels for any roughing or finishing operation in your plant. Write us at no obligation!

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A Sterling cup wheel, size 8x1x⅝, specification KA146 P6 B4, was tested against competitive brands in a well known plant grinding steel castings. The Sterling "Wheel of Industry" was much better than the other wheel—offered much longer life and faster stock removal.

Such results are not unusual. In your own plant, Sterling Grinding Wheels will give you extra values far beyond what you would ordinarily expect. Our engineers wait the opportunity to serve you with a wheel test or complete grinding survey of your equipment . . . no obligation, of course!

Ask for These Free STERLING Research and Development Folders . . .

In these folders you have an interesting bird's eye view of all types of grinding procedures. If you are interested in knowing the proper wheel to use on various kinds of grinding, these folders will quickly tell you. In addition, there will be sent you the popular "Art and Science of Grinding" now in its fifth edition. Write us on your company letterhead and we will do the rest.

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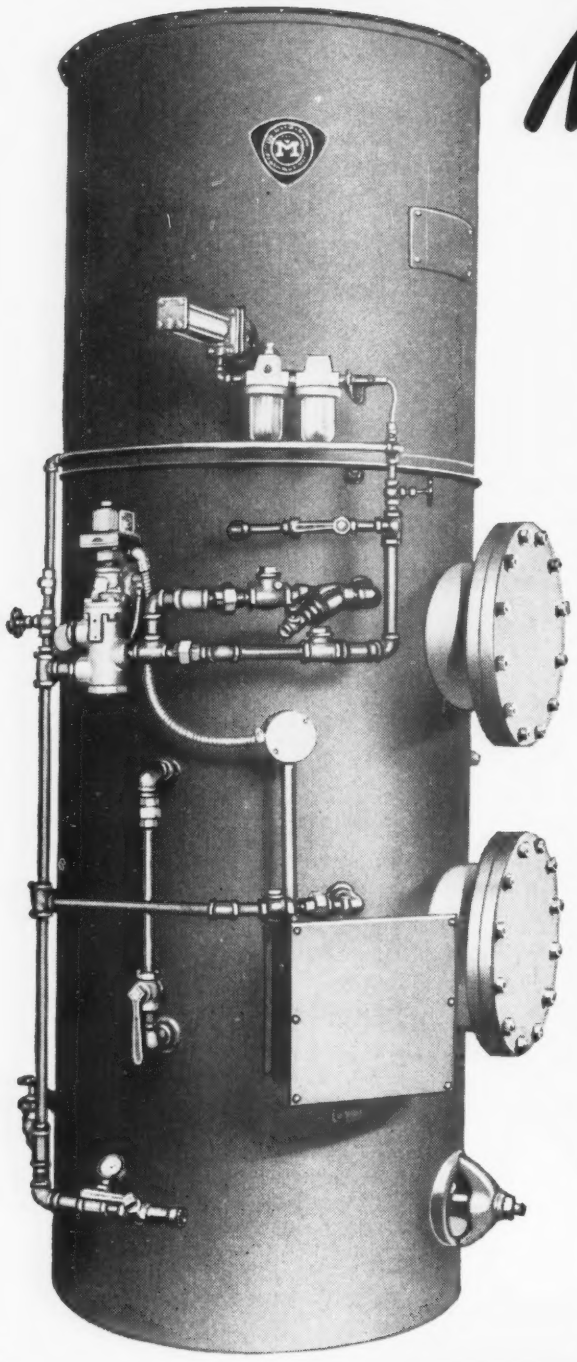
MACLEOD

DUST ARRESTERS
BLAST EQUIPMENT
FOUNDRY SUPPLIES

EST. 1897



NEW! The Completely Automatic

MACLEOD "AUTO-BLAST" ABRASIVE BLAST CLEANING MACHINE

Self-Contained..Large Capacity..Can Give 24-Hours-A-Day Continuous Blasting If Required

A completely new Macleod engineering development. A double-chamber blast cleaning machine with a continuous blasting cycle—no shutdown time for reloading. The Macleod "Auto-Blast" is foolproof . . . requires no operator at the machine.

The refilling cycle is entirely automatic and does not depend on outside sources—such as a synchronized timing device, or motor-driven pumps or valves. The automatic cycle unit is built into the machine and is not influenced by the type or rate-of-flow of the abrasive. No interchangeable abrasive controls are required and the number and diameter of nozzles is no problem.

The Macleod "Auto-Blast" machine can be used with rooms, tables, barrels, or special automatic devices. Send for complete descriptive literature.

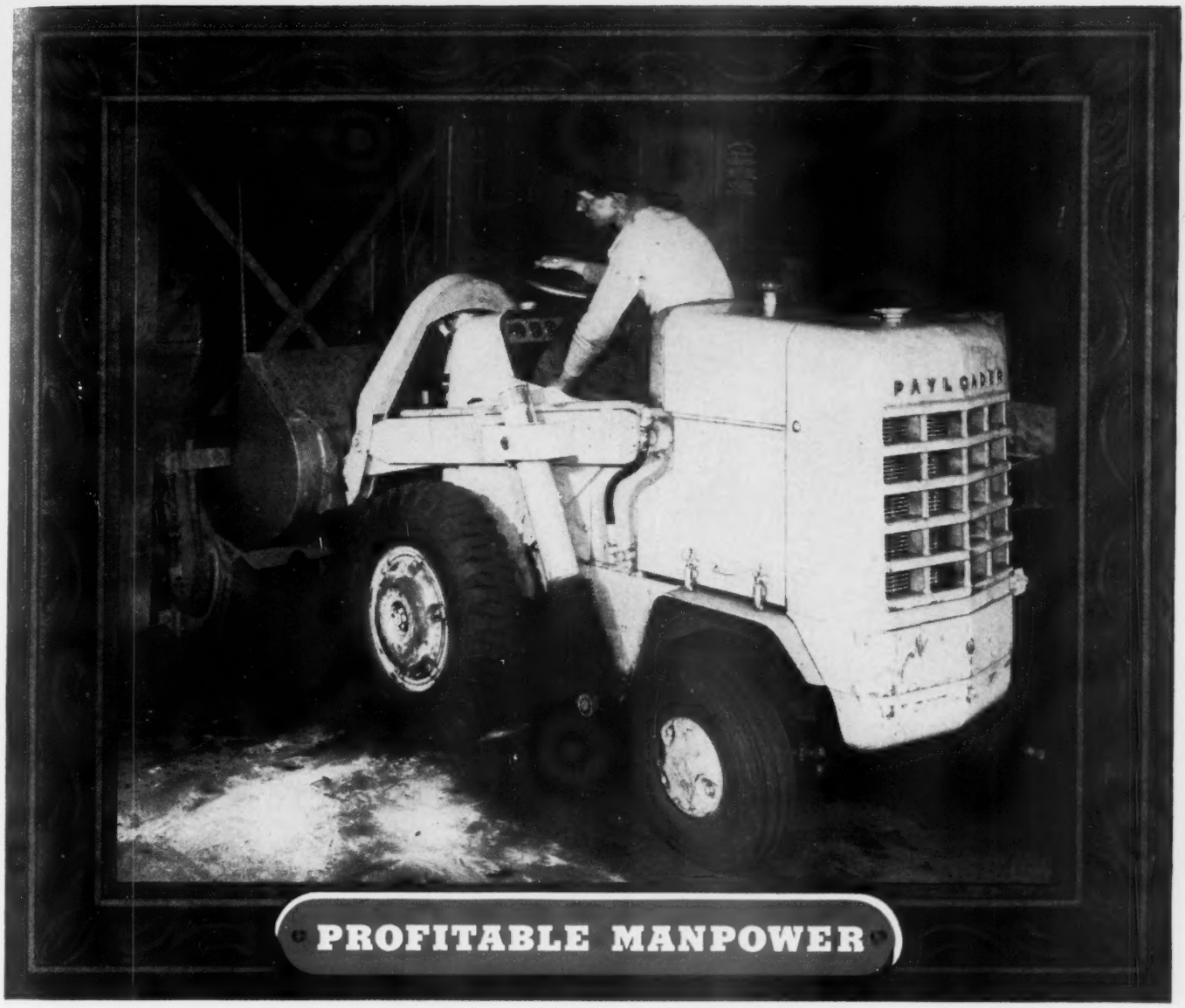
MACLEOD BLACKING SWAB SPRAYERS

These sprayers have been especially designed for foundry use. They work on the suction principle and require compressed air to operate. They spray liquid facing on dry sand molds, or oil on dry sand cores —penetrating into the pores of the sand and into the pockets and corners which would be missed with the ordinary swab. Available in steel, brass, and copper, and in four sizes—1 to 5 quart capacities.

THE MACLEOD COMPANY SOLE MANUFACTURERS CINCINNATI, O. U.S.A.

The MACLEOD Company

2232-40 BOGEN ST. CINCINNATI 22, OHIO, U.S.A. ESTABLISHED 1897

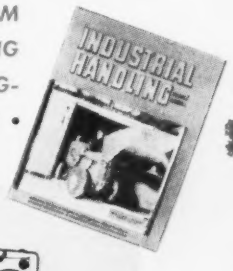


This man may have been good with a wheelbarrow and hand shovel, but his production is several times greater as a "PAYLOADER" pilot. He's happier and so is his boss because they both make more money.

When it's a matter of handling bulk materials — sand, scrap, coke, chips, limestone or *any* bulk material — chances are you can move it faster, cheaper and better with a "PAYLOADER" because these special tractor-shovels are proven cost-cutters in hundreds of foundries.

"PAYLOADERS" are available in seven sizes, from 12 cu. ft. to 1½ cu. yd., to master your jobs both indoors and outdoors. Get full facts *now* on cost-cutting, time-saving, production-boosting "PAYLOADER." The Frank G. Hough Co., 703 Sunnyside Ave., Libertyville, Ill.

UNLOAD BOX CARS • CARRY SAND, COKE, SCRAP, LIMESTONE, ETC. • TRANSPORT AND DISTRIBUTE SAND TO MOLDING STATIONS • REMOVE USED SAND FROM FLOORS • WINDROW SAND FOR THE CUTTER • CHARGE MULLERS, TUMBLING BARRELS • FEED CONVEYORS, ELEVATORS, HOPPERS, MIXERS • CLEAN UP GANGWAYS, AISLES AND OTHER AREAS • HANDLE SCRAP, SMALL CASTINGS, SLAG • LIFT-HAUL-PUSH-PULL • REMOVE SNOW.



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and "Industrial Handling" is full of profitable ideas developed by "PAYLOADER" users. A request on your letterhead gets you on the regular mailing list without cost.

SAY "HUFF"

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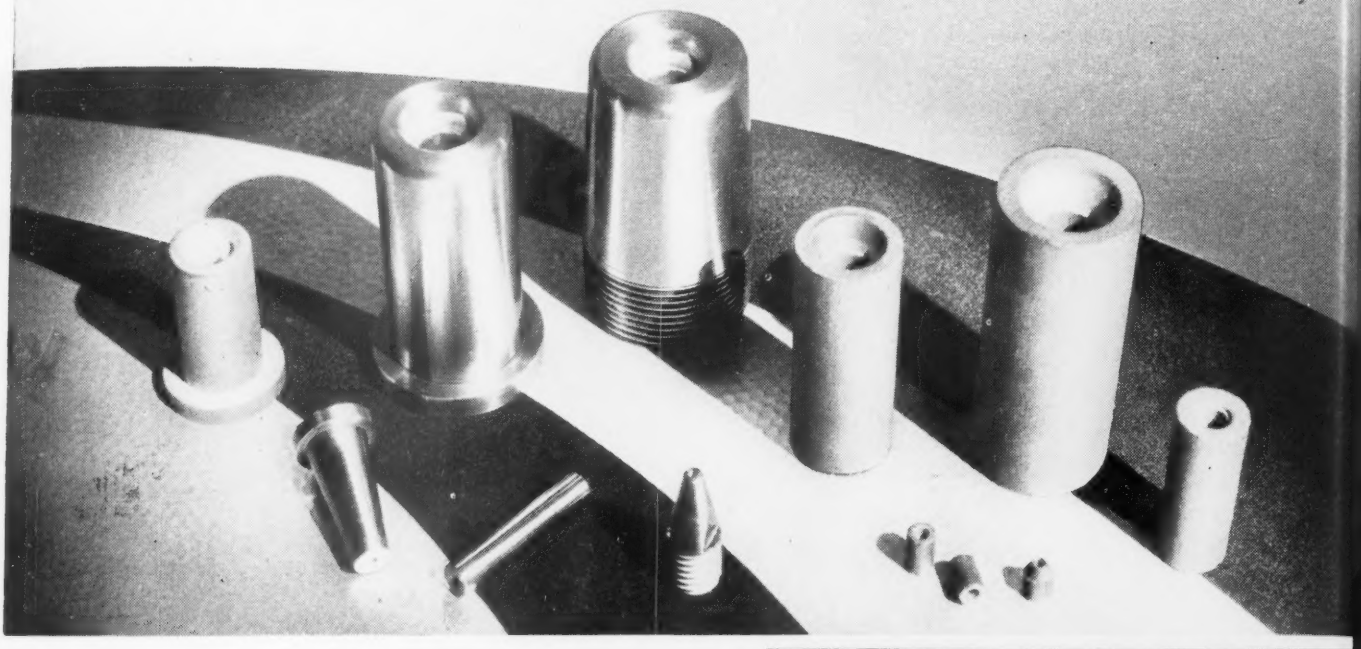
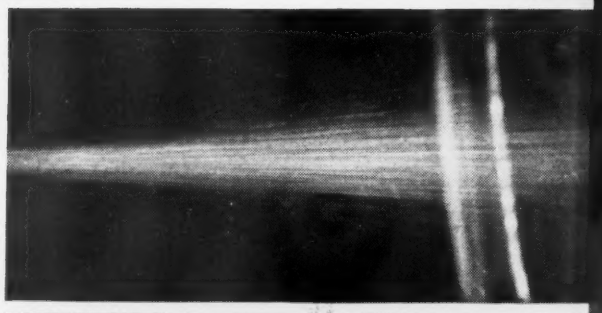
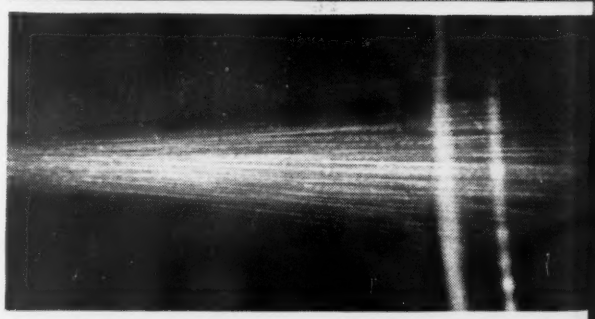
THE FRANK G. HOUGH CO. · *Since 1920*

You Can Increase Nozzle Life

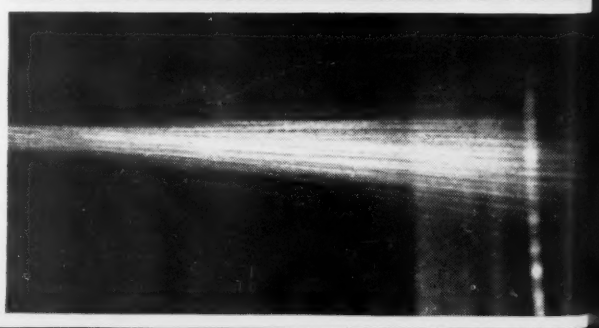




High speed photograph of stream from new iron nozzle — note that stream concentration and abrasive velocity and volume are fair.



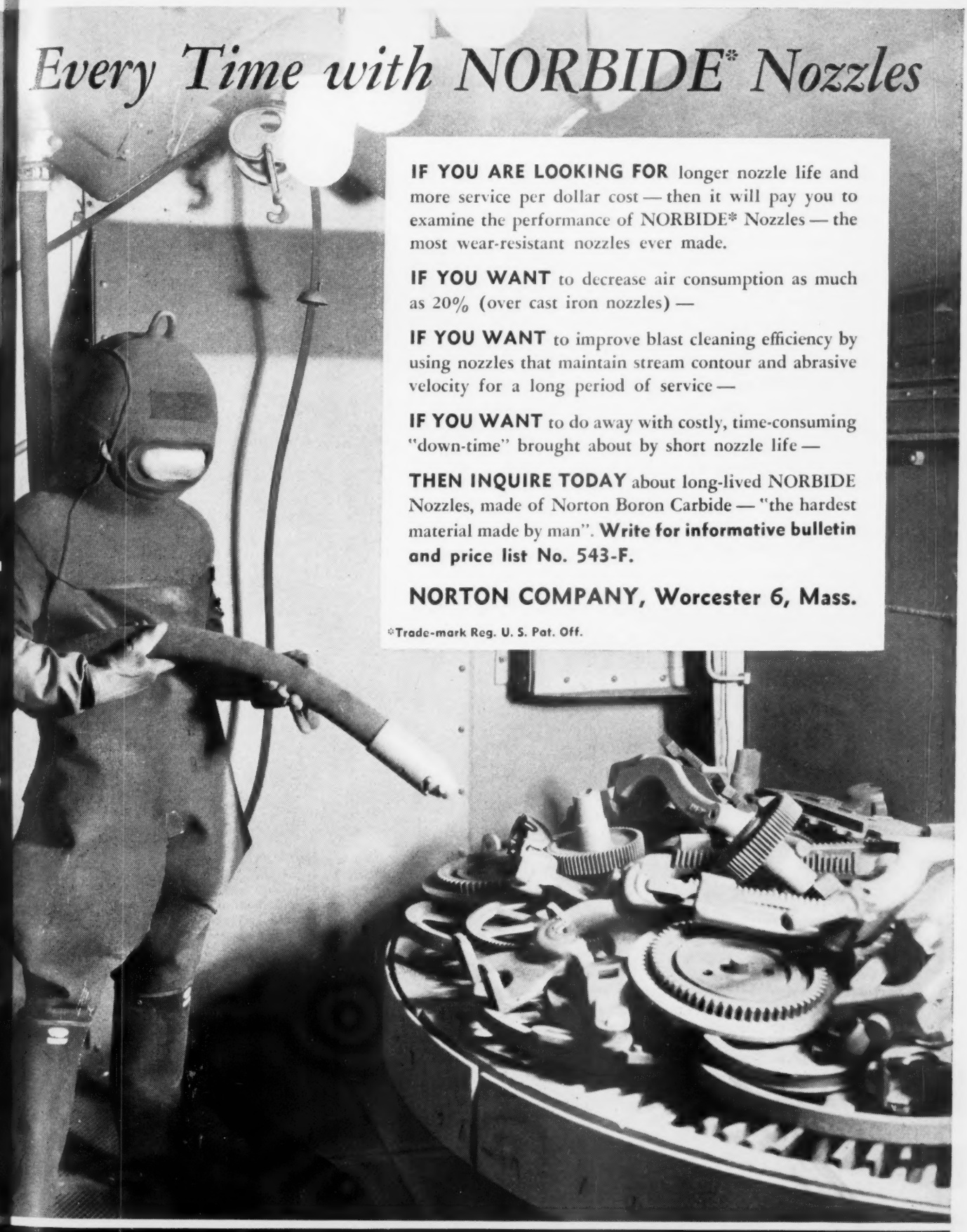
Stream from the same nozzle after three hours with silica sand. Outlet opening worn to twice original size — stream concentration poor, abrasive velocity and volume low.



Stream from Norbide Nozzle after 404 hours with sand — outlet diameter worn only 0.032"—hundreds of hours of useful life remain—marked stream concentration—high abrasive velocity and volume.

NORTON WEAR-RESISTANT PRODUCTS

Every Time with NORBIDE Nozzles*



IF YOU ARE LOOKING FOR longer nozzle life and more service per dollar cost — then it will pay you to examine the performance of NORBIDE* Nozzles — the most wear-resistant nozzles ever made.

IF YOU WANT to decrease air consumption as much as 20% (over cast iron nozzles) —

IF YOU WANT to improve blast cleaning efficiency by using nozzles that maintain stream contour and abrasive velocity for a long period of service —

IF YOU WANT to do away with costly, time-consuming "down-time" brought about by short nozzle life —

THEN INQUIRE TODAY about long-lived NORBIDE Nozzles, made of Norton Boron Carbide — "the hardest material made by man". **Write for informative bulletin and price list No. 543-F.**

NORTON COMPANY, Worcester 6, Mass.

*Trade-mark Reg. U. S. Pat. Off.

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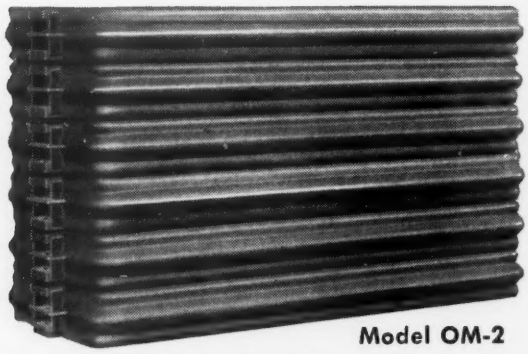
QUICK and EFFICIENT in ACTION



Model OM-2

These flask sections are double faced and equipped with double bearing combination welded handles and pin lugs. Any number of sections can be placed one upon the other for multiple molding. Malleable combination handles and pin lugs can be riveted on when desired.

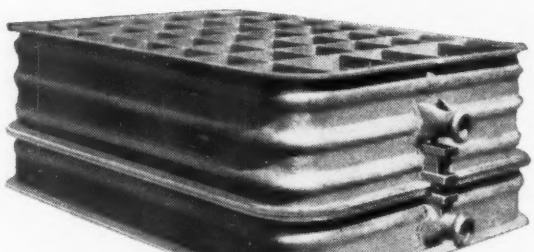
Model TM-12

This particular model is a double faced flask with sand strip at top and bottom of each section. Each section is equipped with single bearing pin lugs at top and bottom. Suitable for stacking.

Truscon Steel Foundry Flasks are designed and built to meet the particular requirements of the individual job. The correct thickness of the flask walls, the proper placing of the flanges, the types of handles and pin lugs—every detail is designed with skill and precision to assure efficient action in foundry operation.

The flanges and ribs of Truscon Steel Flasks are particularly designed to help the molder. The flange on the filling side is turned out and will not interfere with filling or shaking out. The flange on the bottom side or parting line is turned in, forming a sand strip to carry the sand.

There's every size of Truscon one-man, two-man, and power-handled Steel Flasks available to give you quick and efficient action in your foundry. Write for illustrated literature.



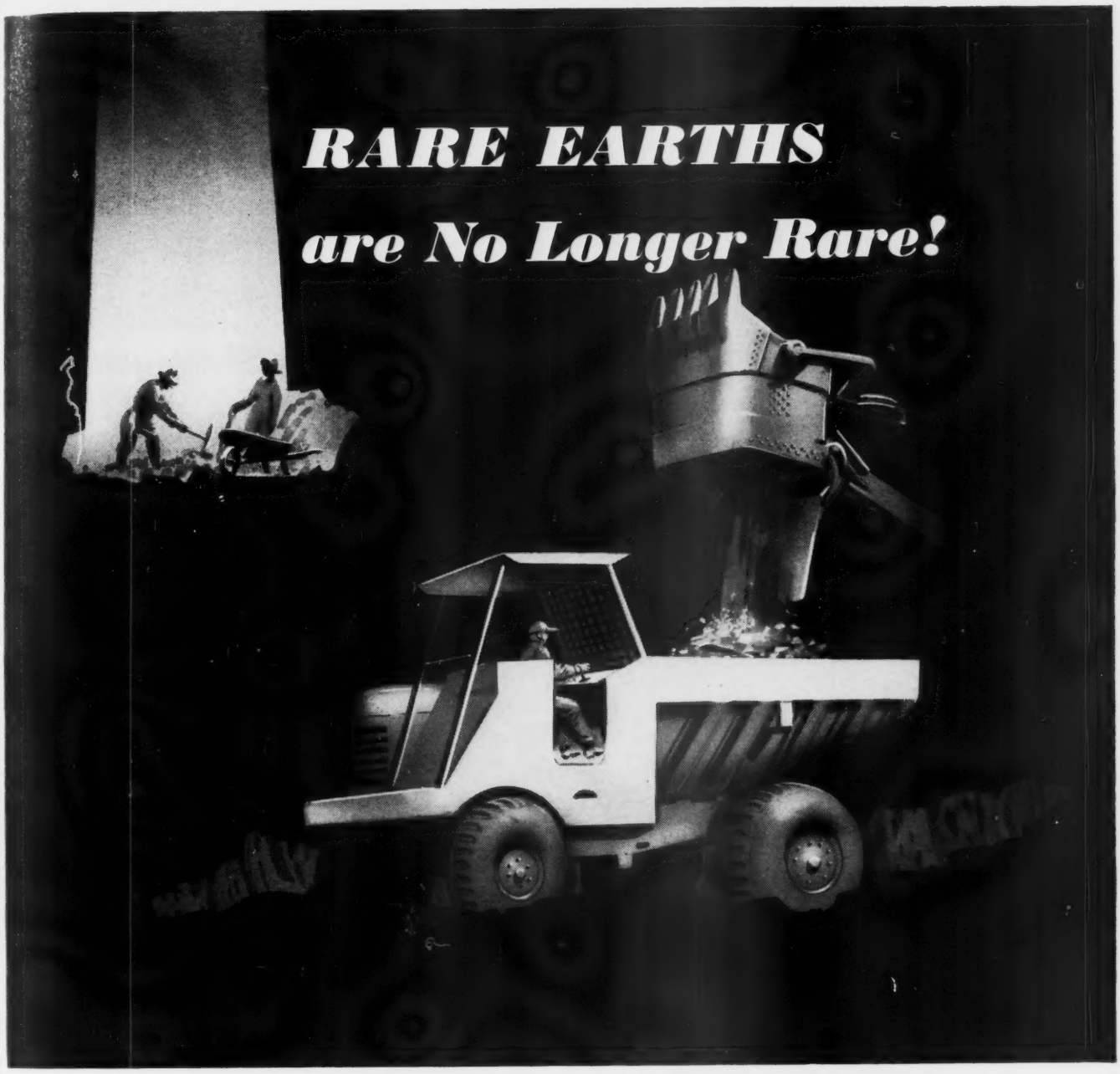
Model CH-40

This is an extremely large flask for extra heavy duty. It has an intricate barring arrangement and illustrates double bearing welded pin lugs on cope and single bearing welded pin lugs on drag. Extra heavy duty trunnions are securely welded to flask.

TRUSCON MARK OF MERIT PRODUCTS

TRUSCON® STEEL COMPANY • Pressed Steel Division

6208 Truscon Ave., Cleveland 4, Ohio • Subsidiary of Republic Steel Corp.



NEW abundance of raw materials obtainable within the United States, newly developed methods of refinement, new knowledge of the extraordinary properties of some of the "rare earth" substances for highly technical uses . . .

Such are the considerations that have led the Molybdenum Corporation to make substantial investments in a mining property, modern equipment, and continuing technical research.

Whatever your present or future interest in rare earth materials, inquiry directed to the Molybdenum Corporation will be welcomed. Not only production facilities but MCA knowledge and experience are at the service of industry.

As a supplier of Molybdenum, Tungsten, Boron, and other alloying elements, the Molybdenum Corporation invites and solicits correspondence.

AMERICAN Production, American Distribution, American Control, Completely Integrated

Offices: Pittsburgh, New York, Chicago, Cleveland, Detroit, Los Angeles, San Francisco

Sales Representatives: American Steel and Supply Co., Chicago; Edgar L. Fink, Detroit; Brumley-Donaldson Co., Los Angeles, San Francisco

Subsidiaries: Cleveland-Tungsten, Inc., Cleveland, O.; General Tungsten Manufacturing Co., Inc., Union City, N.J.

Works: Washington, Pa.; York, Pa.

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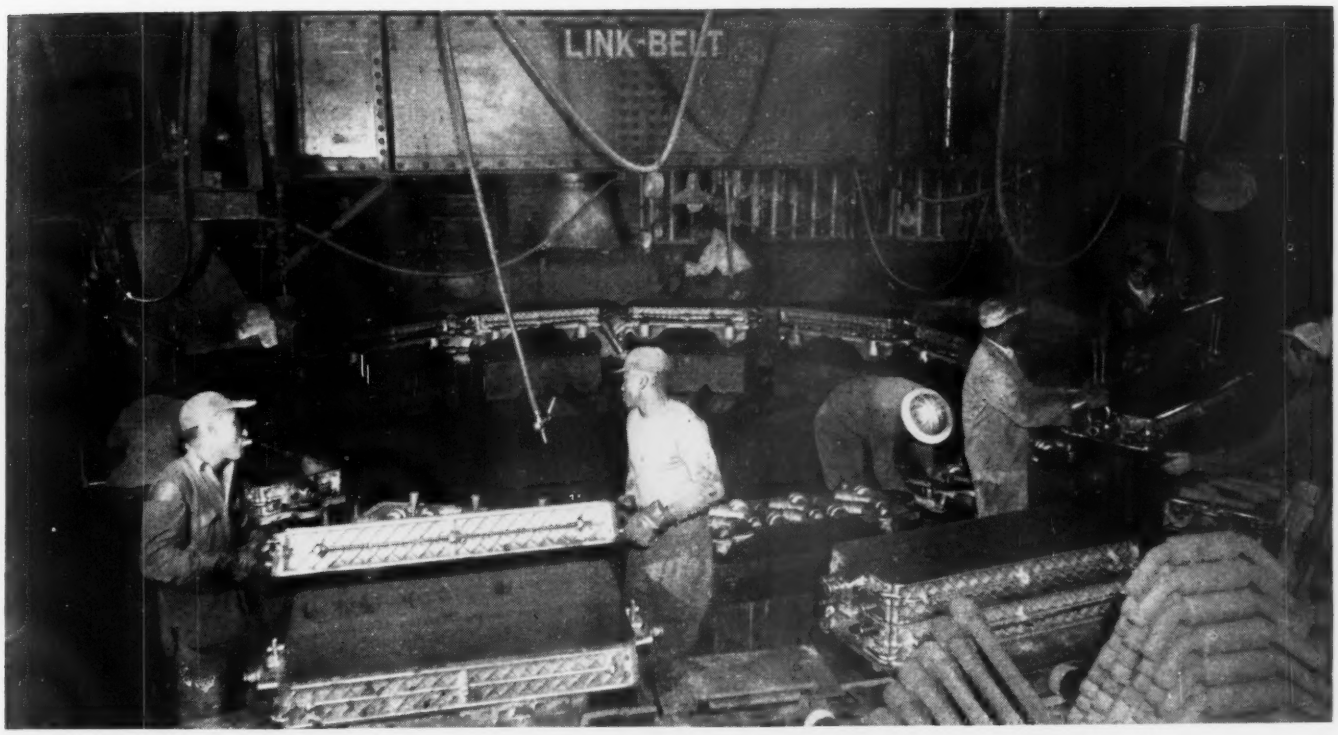
THE ONE-MAN-GANG®

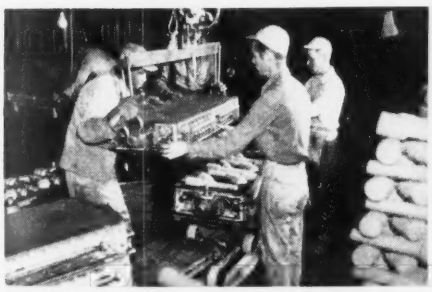
FORK LIFT TRUCKS AND TRACTORS

RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

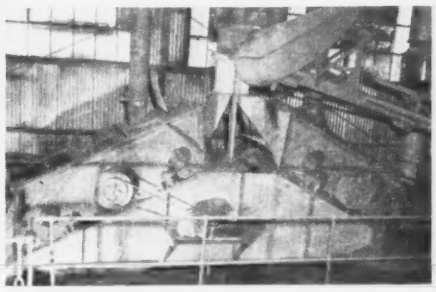
LINK-BELT helps Central Foundry step up production



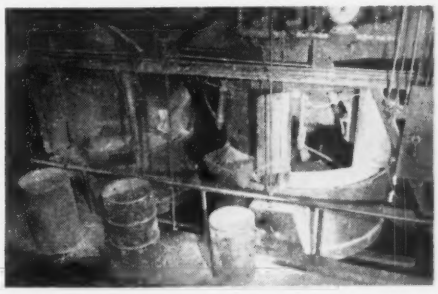
1 Mechanization by Link-Belt at Central Foundry Co., Holt, Alabama, has resulted in increased production and better working conditions. Continuously moving Tru-Trac mold conveyor, above, is 110 ft. long.



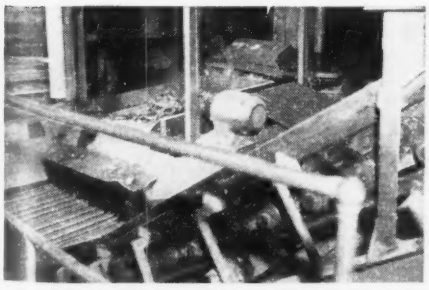
2 After cores have been set, molds are closed. Tru-Trac Conveyor continues to pouring station, thence through cooling zone to central shakeout point.



3 Twin UP Vibrating Screens over the storage bin receive sand from elevator and shakeout via belt conveyor. Large sand capacity necessitates dual installation.



4 Uniform and proper sand conditioning is continuously obtained at Central Foundry. Two muller type mixers shown here prepare and cool the sand.



5 Tilting top trays discharge molds to shakeout. Castings go over end of shakeout screen to apron conveyor. Complete mold, sand and castings handling equipment was designed, built and installed by Link-Belt.

If you have a mechanization or sand preparation problem in your foundry, a Link-Belt foundry engineer will be glad to discuss it with you or your consultants. For complete information, call the Link-Belt office near you.

LINK-BELT

CONVEYORS and PREPARATION MACHINERY

MEMBER FEMA

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities. 12,828

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MORE EXACTING WORK

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Magnesium weighs 1/3 less than aluminum.

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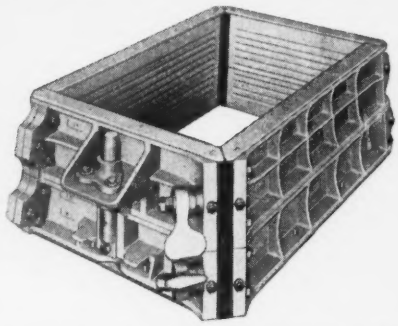
FREMONT, OHIO

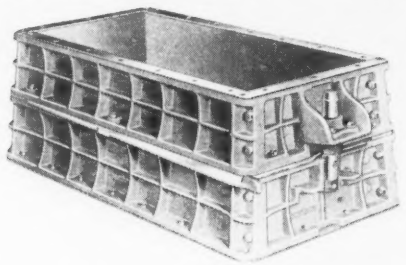
The New

FREMONT SPREADLOCK FLASK



Long-life, easily replaceable, live rubber corner inserts completely close the corner gaps so that no sand can lodge in the open corners.

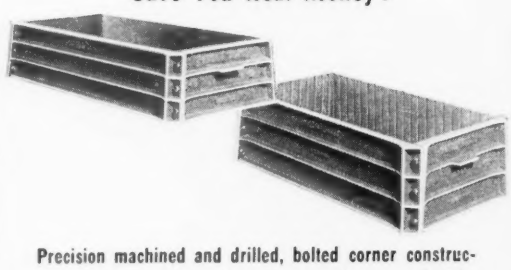
FREMONT STANDARD SLIP FLASK



The one-inch **GROOV-LOCK FOOLPROOF PIN**, particularly adapted to cope or drag pattern jobs, guarantees perfect alignment indefinitely. (Other types of standard pin fittings available.) Solid, bolted and welded corner construction.

FREMONT CAST IRON OR CAST ALUMINUM JACKETS

Save You Real Money!



Precision machined and drilled, bolted corner construction permits easy insertion of new sides or ends. The entire jacket need not be scrapped. Standard style for ordinary foundry practice. Grooved style, which permits ready gas escape, for steel foundries. Glass and jackets can be assembled on 3°, 4°, or 5° taper.

HIGHEST QUALITY CASTINGS ARE ANNEALED IN 48 HOURS BY THIS LARGE ELEVATOR FURNACE, ONE OF TWELVE AT THIS PLANT.

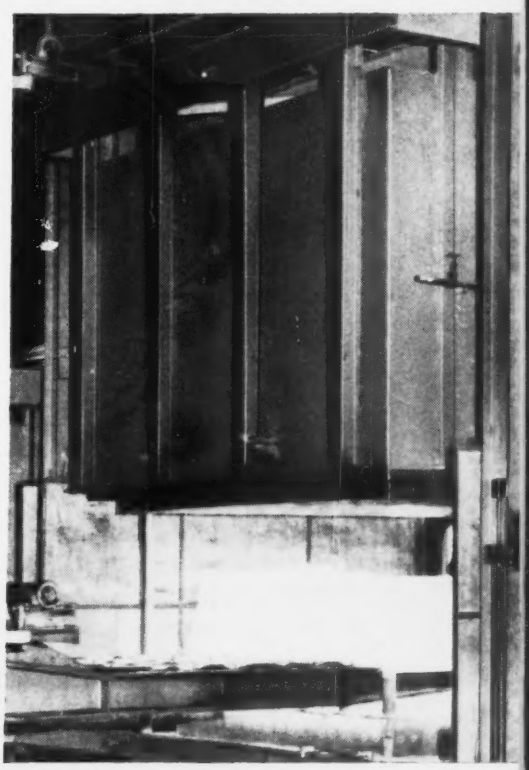
THREE MALLEABLE FOUNDRIES SAVE TIME, CUT COSTS WITH G-E ELECTRIC FURNACES

Like these three plants, you may find you can drastically cut annealing time, reduce over-all costs and produce better, more uniformly annealed malleable iron by installing G-E electric furnaces.

Have a cost study made on your plant by an experienced G-E Heating Specialist, as these foundries did. His findings, based on experience with many similar applications, will offer proof that a G-E electric furnace will give you the greatest long-range return for your capital investment.

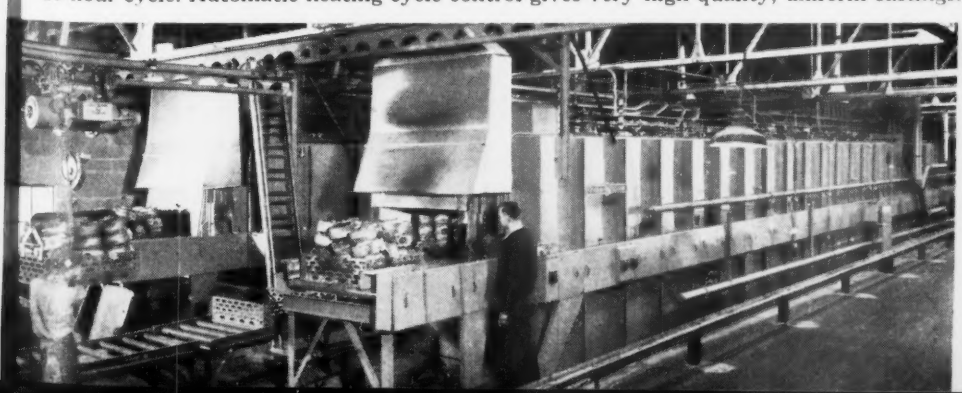
You can select all your heat-treating equipment from G.E.'s complete line of electric furnaces, atmosphere equipment and handling equipment for nearly every heat-treating process. Start your plant planning by contacting the nearby G-E Sales Office for the recommendations of an Industrial Heating Specialist. Or write Sect. 720-80, *General Electric Co., Schenectady, New York.*

GENERAL ELECTRIC



ANNEALING TIME WAS CUT from 6 days to 48 hours here by using G-E bell-type furnaces. Electric heat produces better-annealed castings at a lower unit cost.

26 TO 30 NET TONS of castings are annealed daily by this roller-hearth furnace on a 21-hour cycle. Automatic heating cycle control gives very high-quality, uniform castings.



YOU'LL DO A BETTER JOB

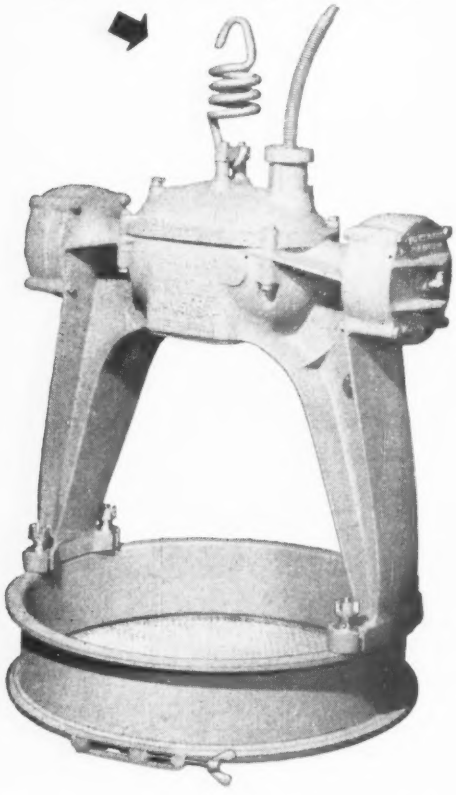
with **H. V. ADAMS DESIGNED**

HIGH EFFICIENCY FOUNDRY TOOLS

"UNIVERSAL FREE WHEELING"

FOUNDRY SAND RIDDLE

with the Double Eight Vibration

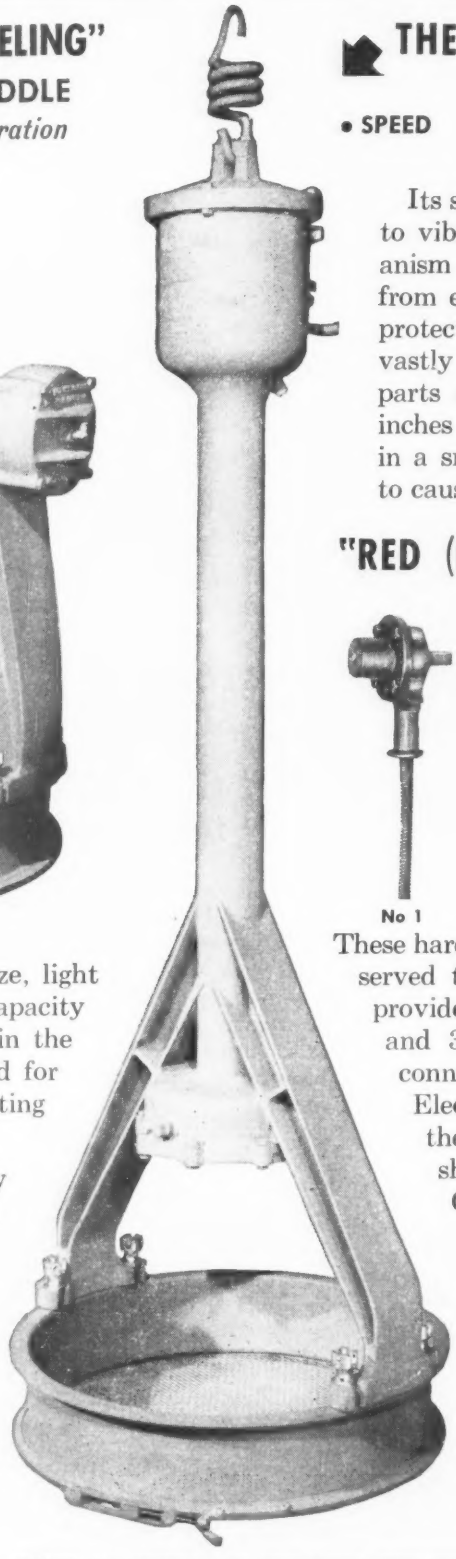


Because of its convenient size, light weight and good riddling capacity it long has been a favorite in the foundry. It also can be used for mixing core sand or for sifting sand directly into molds.

The mechanism is entirely enclosed protecting it from harmful dust and grit.

The main frame is cast in very strong tough aluminum.

It uses quick change ferruled sieves with 20 in. diameter sifting area. There are no loose wires to harm hands.



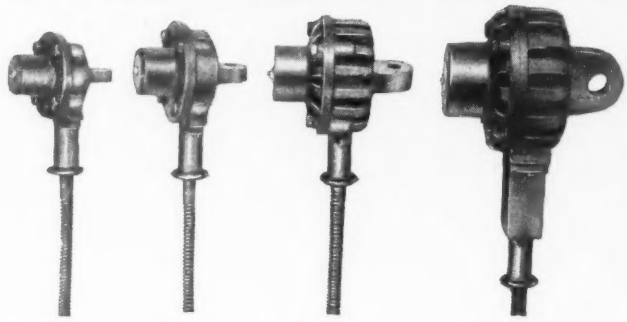
THE "ROTOPLANE" SPEED SIFTER

WILL GIVE YOU

- **SPEED**
- **ECONOMY**
- **SAFETY**
- **LONGER LIFE**
- **GREATER SIFTING CAPACITY**

Its sturdy one-piece frame and long shaft add to vibration effectiveness. The sealed-in mechanism assures protection of motor and bearings from exposure to dust and grit. This sealed in protection and "Rotoplane's" free-rotary action vastly increase bearing life. No exposed moving parts endanger the operator. Sieves have 20 inches diameter clear sifting area — are mounted in a smooth steel ferrule with no jagged edges to cause dangerous cuts and scratches.

"RED (Devil) ELECTRIC" VIBRATORS



No 1 No. 2 No. 5 No. 9

These hard hitting Adams designed Vibrators have served the foundries for over 30 years. They are provided with a 6 foot 3 wire authorized cable and 3 wire grounded connector which, when connected with our 3 wire grounded Red Electric Knee Switch, automatically grounds the vibrator protecting the worker from shock. The vibrators have passed the U. S. Government code inspection.

Other Foundry Products:

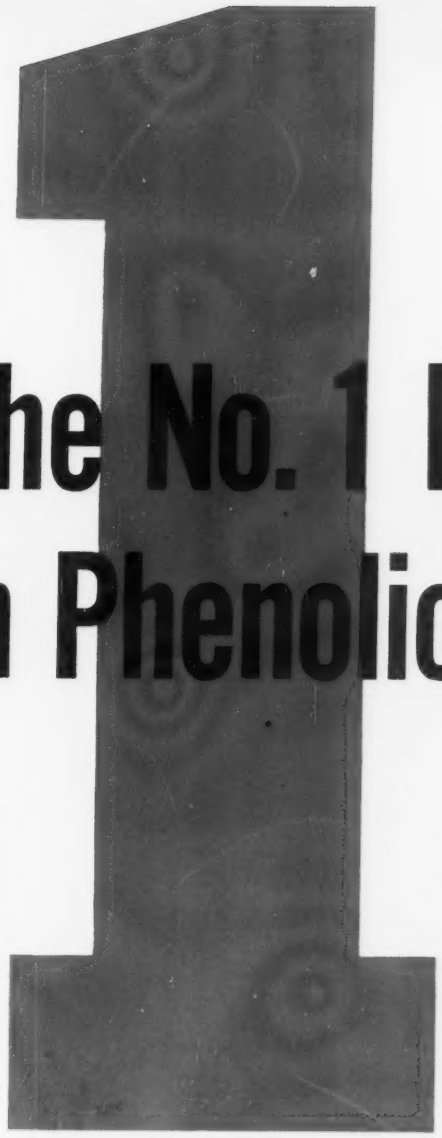
- **No. 11 NOISELESS TYPE VIBRATOR**
- **A-20 ELECTRIC VIBRATOR**
- **RED ELECTRIC KNEE SWITCHES**
- **"ROTO" ADJUSTABLE BIN VIBRATOR**
- **2 MIN. UNIVERSAL FINENESS TEST SIFTER.**
- **UNIVERSAL TRIPOD CARRIER**

ORDER ALL SIFTERS AND VIBRATORS WITH GROUND WIRE!!

FOUNDRY SUPPLIES MANUFACTURING CO., NOT INC.

2221 Orchard Street - Chicago 14, Illinois

Established 1918 **Cable Address: "Rotoplane Chicago"** **H. V. ADAMS, Mgr.**



For shell molding and core binders . . .

The No. 1 Fact in Phenolic Resins today

Barrett gives you these 4 assurances of uniform high quality

1. **The raw materials**
2. **The service**
3. **The plant**
4. **The experience**

In the required raw materials, Barrett has a basic position because Barrett is a basic producer.

In formulations for your specific needs, Barrett test laboratories are at your service and Barrett technical assistance is available to your plant.

In production and laboratory facilities, the Barrett resins plant at Philadelphia is equipped to handle a wide variety of resins and varnishes.

In resin research and development, Barrett has had a quarter of a century of experience.

Barrett* Phenolic Resins help you produce better castings at lower cost

You get:

- *Thin, light-weight shells*
- *Castings with superior finish*
- *Closer tolerances*
- *Molds and cores of uniform high quality*

You save:

- *Materials—less scrap, less sand*
- *Time—less machining*
- *Manpower—less handling*
- *Money—in every way*

Barrett*

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ALLIED CHEMICAL & DYE CORPORATION
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Barrett is Basic

*Reg. U.S. Pat. Off.

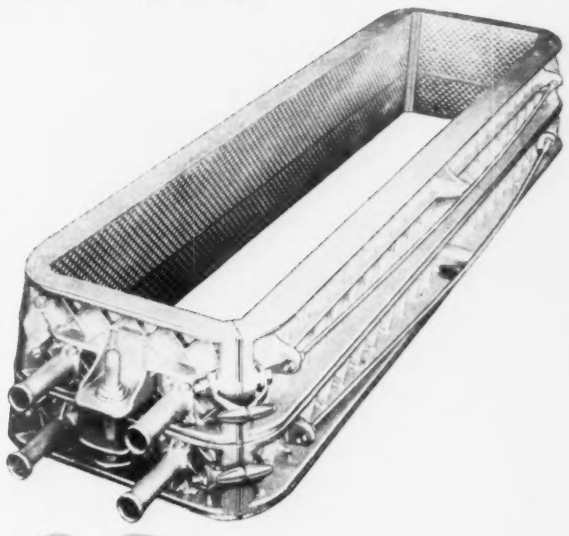
eco

nomy

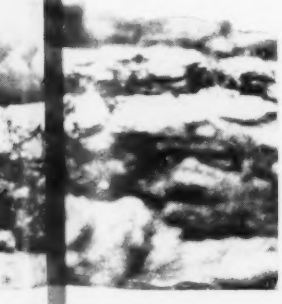
Despite his amusing gambols and antics, the squirrel can assume a serious mood at times. Particularly toward the end of autumn, when he practices sound *economy* by storing away a good portion of the acorns and nuts he finds, for the long winter ahead.

Foundries, too, can exercise prudent economy by making use of HINES "Pop-Off" FLASKS. For there's no other type of foundry equipment in which they can invest that will pay bigger dividends. HINES FLASKS contribute substantial savings by producing an unusually high percentage of perfect molds and, conversely, less scrap. This advantage, plus long service and trouble-free performance, is why so many foundries have turned to HINES for economy.

We'll be glad to have an opportunity to prove these statements for you. Contact your HINES representative or write direct.



The squirrel searches for seeds, fruits and other foods in the early morning or in the cooler hours of the afternoon. The hotter part of the day it spends in its nest high up in the fork of a lofty bough. In the fall it exhibits a true spirit of providence by gathering acorns and nuts and hiding them away in holes and crevices near the tree in which it dwells. In the winter, whenever the squirrel requires nourishment, even though snow be on the ground, it scratches away the snow and unerringly recovers its hidden treasures.



Hines

HINES POP-OFF FLASK **FLASKS**

THE HINES FLASK CO.

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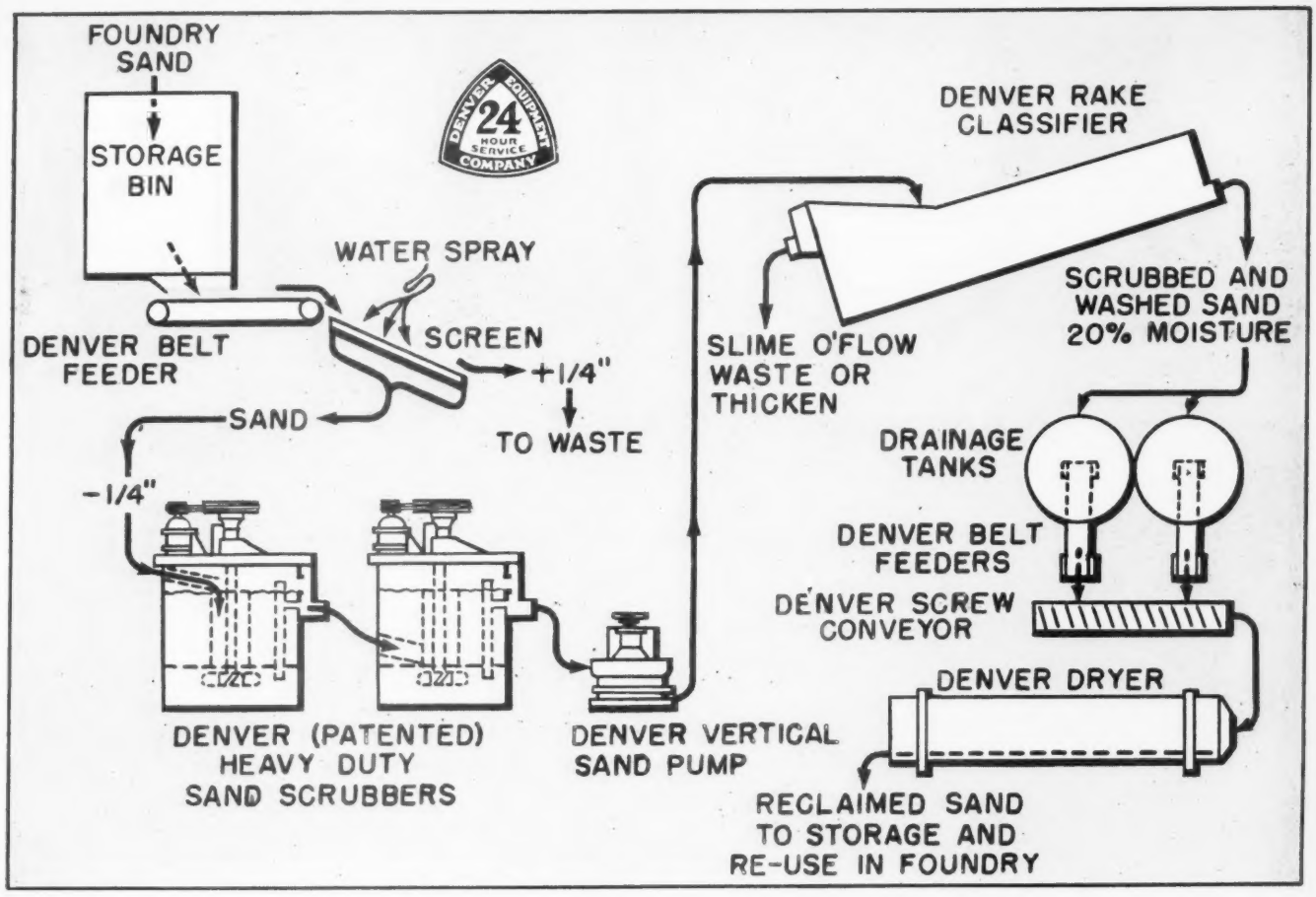


FLOWSHEET FOR RECLAIMING SAND FOR AS LITTLE AS 75¢ PER TON

This simple method of sand reclamation has 3 definite advantages:

1 *Simplicity of installation and operation.*
2 *Low-cost capital investment and low-cost operation.*
3 *Efficiency of removing spent clays, binders and carbon.*

SIMPLICITY: Equipment is standard, can be located wherever space permits. 3 to 4 ton per hour system as shown above requires space 32′ x 44′ but space need not all be in one location. Continuous operation requires minimum labor. Complete reclamation systems are available from 1 T.P.H. up.

LOW-COST: Equipment required for 3 to 4 ton per hour as illustrated above runs approximately $15,000 (piping and conveying is not included). Motors require a total of 16½ horsepower. Water can be reclaimed for reuse if necessary. Rubber-covered wearing parts give long service. Cost of reclaiming sand runs about 75c to $2 per ton depending on quantity of sand reclaimed. Recovery is normally 80% to 90%.

EFFICIENCY: Scrubbing at high densities (40% water–60% sand) results in attrition of grains striking each other. 30 minutes contact time in Denver (Patented) Heavy Duty Scrubbers is usually sufficient to remove carbons and binders. Patented standpipe prevents short-circuiting. Dewatering and rinsing is done in standard Denver Rake Classifier. Classification also controls percentage of fines in reclaimed product. Drying is done by gravity drainage or by Denver Standard Dryer.

MAKE THIS TEST Small scale laboratory tests on your sand will be made on a cost only basis. Reclaimed sand will be returned to you for complete analysis and test casting. If you are not satisfied with test results there will be no charge. Write for complete details and shipping instructions.

ADDRESS:
Foundry Sand Reclamation Division
Box 5268 • Denver 17, Colorado
Phone CH 4466

Our 25th Year

DENVER EQUIPMENT COMPANY • 1400 17th Street • Denver 17, Colorado

SIMPLICITY model V-S conveyors help speed production and cut costs of handling hot foundry sand

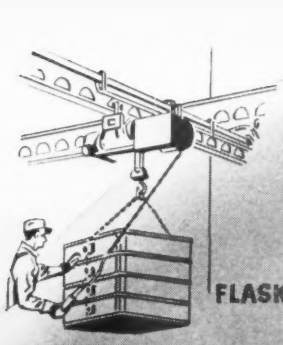
At a foundry producing a variety of malleable iron castings, this 36" x 30' Simplicity Model V-S Conveyor moves hot sand from two shakeouts up a 3° incline to an elevator at an average rate of 80 tons with a peak load of 120 tons per hour. As the sand moves along the conveyor, water is added and plows turn the sand thus reducing the sand temperature 100°. The sand is discharged into the elevator boot over a permanent magnet that removes all metal particles.

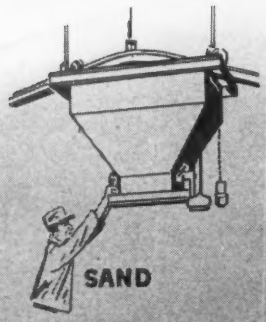
Simplicity Conveyors and Os-A-Veyors greatly simplify the movement of sand and castings and hot abrasive materials in foundries. They can be installed to carry most any type or quantity of material you need. Simplicity Conveyors and Os-A-Veyors are easy and inexpensive to operate, maintain and repair.

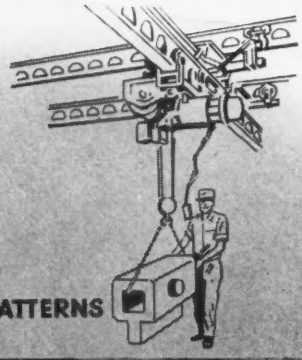
112

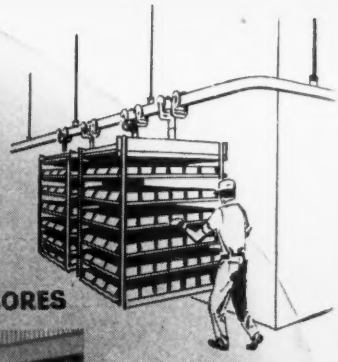
- Sales representatives in all parts of the U. S. A.
- FOR CANADA: Canadian Bridge Engineering Co., Ltd., Walkerville, Ontario
- FOR EXPORT: Brown and Sites, 50 Church Street, New York 7, New York

Simplicity
TRADE MARK REGISTERED
ENGINEERING COMPANY • DURAND, MICHIGAN

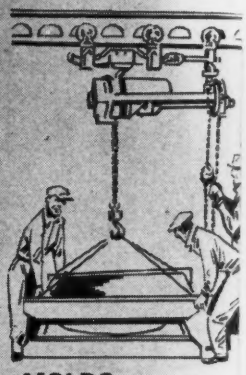


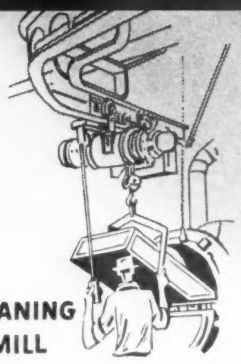


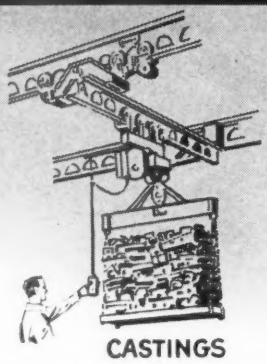


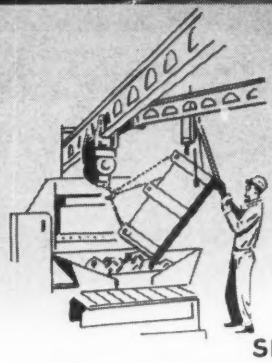


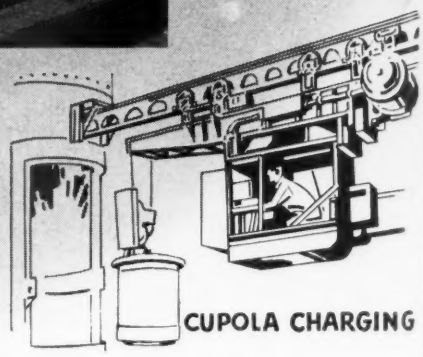
Versatile Cleveland Tramrail Speeds Every Foundry Operation







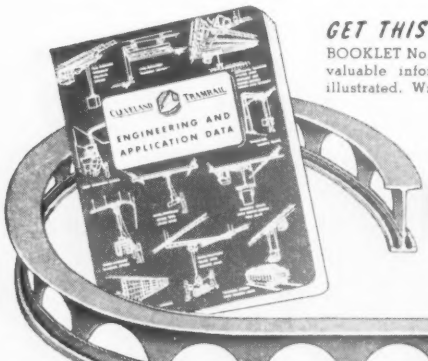




Wherever materials must be lifted and moved, Cleveland Tramrail overhead materials handling equipment can save time, make the work easier and safer, speed production and cut costs.

Because 150 to 250 tons of various materials must be handled to produce a ton of finished castings, foundries find Cleveland Tramrail particularly advantageous. In many cases the use of Cleveland Tramrail means the difference between profit and loss. Because it affects the price of the finished product so greatly, it will be a key factor for numerous foundries in obtaining orders during periods when the competitive situation is keen.

Talk over your foundry handling with a Tramrail engineer. A nearby representative will be glad to visit you without obligation.



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THE CLEVELAND CRANE & ENGINEERING CO.
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CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

DOW CORNING SILICONES

Solve another production problem

FIRST IN SILICONES
DOW CORNING 7 EMULSION
SILICONE RELEASE AGENT FOR RESIN BONDED SAND SHELL MOLDS
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DOW CORNING CORPORATION MIDLAND MICHIGAN, U.S.A.

UNEQUALLED AS A PARTING AGENT IN THE SHELL PROCESS FOR CASTING METALS

Dow Corning 7 Emulsion is specified by the most extensive users of this new foundry process. Easily applied by spraying or dipping,

DOW CORNING 7 EMULSION

- Provides fast, clean release of sand shell molds; speeds production.
- Reduces build-up on patterns; helps to maintain close tolerances; cuts cleaning costs and lengthens the life of patterns.
- Gives superior reproduction; improves surface finish; reduces rejects and machining.
- Applied once, will release several molds; saves time.

Easily diluted with water and effective at low concentrations, Dow Corning 7 Emulsion is nonflammable and noncorrosive; safe and easy to use.

Send Today FOR SAMPLE OF DOW CORNING 7 EMULSION
or write Dept. AH-19 for Data Sheet

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DELTA Core & Mold Washes for steel, malleable, gray iron and non-ferrous metals.
Mudding and Patching Compounds
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DELTA Core & Mold Washes for steel, malleable, gray iron and non-ferrous metals.
Partex (Nut Shell Parting)
Liquid Parting
Spray Binders
Bondite

The quality and uniformity of DELTA SPECIALIZED FOUNDRY PRODUCTS are laboratory controlled to insure consistent results in use. Liberal working samples, together with complete instructions for use will be sent to you without cost or obligation. WRITE TODAY.

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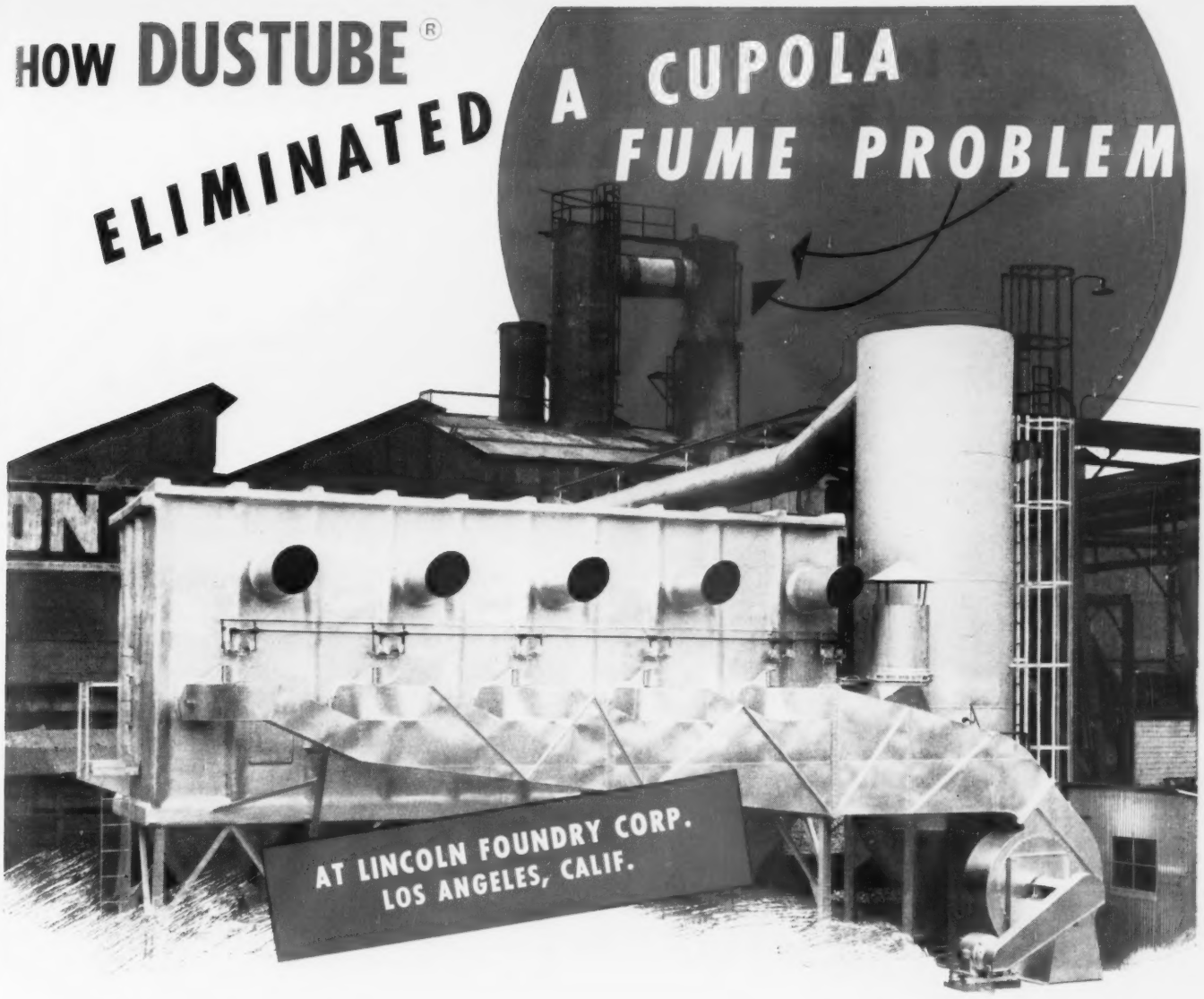
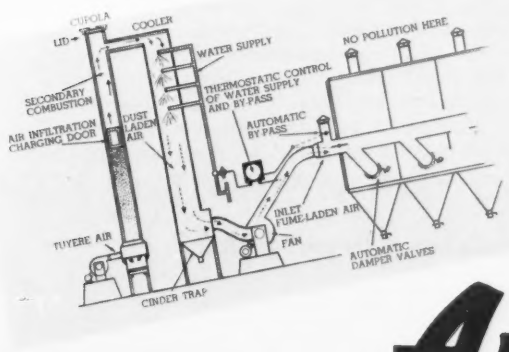
HOW DUSTUBE® ELIMINATED A CUPOLA FUME PROBLEM



There is no atmospheric pollution from *this Cupola*—at the Lincoln Foundry Corp., Los Angeles, California. All fume is passed through a Continuous Automatic Dustube Collector where it is filtered so efficiently there is no visible discharge. The installation has received a certificate of approval from the Los Angeles County Air Pollution Control District.



Flow chart of a Typical Dustube Cupola Fume Control Application

Use of synthetic filtration fabrics in the Dustube Collector makes it possible to handle cupola gases at a high temperature and the fume is separated from the gases with virtually 100% efficiency. The gases are cooled to filtration temperature by the evaporation of water spray. In spite of the water cooling, there is no evidence of condensation in the collector and fume is collected in a dry, free-flowing state.

Lincoln Foundry's selection of the Dustube System was based on these important features:

1. LOWER INITIAL INVESTMENT
2. CONTINUOUS OPERATION WITH AUTOMATIC SHAKING, NO MANUAL LABOR
3. REQUIRES A RELATIVELY SMALL AMOUNT OF SPACE
4. MAXIMUM FILTER TUBE LIFE

You can solve your cupola fume problem more efficiently at lower cost with a Dustube—Get complete details today.

American

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dustube® COLLECTORS

A Leading New England Foundry...

HARTFORD ELECTRIC STEEL CORP.

proves again:

BS&B Foundry Flasks

require only minimum maintenance under continuous production

At Hartford, Connecticut, The Hartford Electric Steel Corp. constantly turns out steel castings of high quality. Helping to maintain this enviable standard is the right equipment–including BS&B Foundry Flasks.

Hartford Electric has been using them exclusively since early 1947. They are also users of BS&B steel bottom boards. Hartford Electric is exclusively a jobbing foundry doing work for major companies. Pictured here is a typical pouring operation after the moulds are made up.

Standardizing on sizes applicable to all jobbing work helps keep production up with a minimum loss of castings. The Medium Weight BS&B Foundry Flasks shown here have the standard loose-pin-lug arrangement and clamping lugs at parting line with trunnions for roll-over. Hartford Electric has found continuous production possible with a very minimum of maintenance costs on BS&B Foundry Flasks.

Write for FREE BS&B Foundry Flask Handbook

A handy catalog and useful foundryman's "bible"... includes easy-to-order system.

...and for heavy service it's the BS&B Heavy Duty Flask

Whether your operation is light, medium or heavy, there's a BS&B Foundry Flask for you . . . a tailor made flask. We study your requirements, the type of castings you want to turn out, and other important factors. We may recommend the BS&B Heavy Duty Flask. If so, you'll have the only heavy duty flask combining these three features: (1) Welding of bearing strips both inside and out; (2) Cast steel trunnions; (3) Cast steel pin lugs and clamp lugs.

Foundry Flask Division—Dept. 7-AR7

FOUNDRY BS&B FLASKS

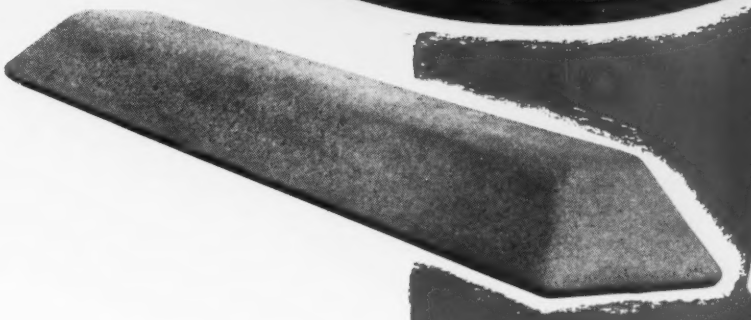
BLACK, SIVALLS & BRYSON, INC.

Kansas City 3, Missouri — 7500 East 12th Street

MELTRITE

PIG IRON

Making MELTRITE
Beginning of a cast of molten iron.



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MORE USED THAN ANY OTHER MERCHANT PIG IRON

P M

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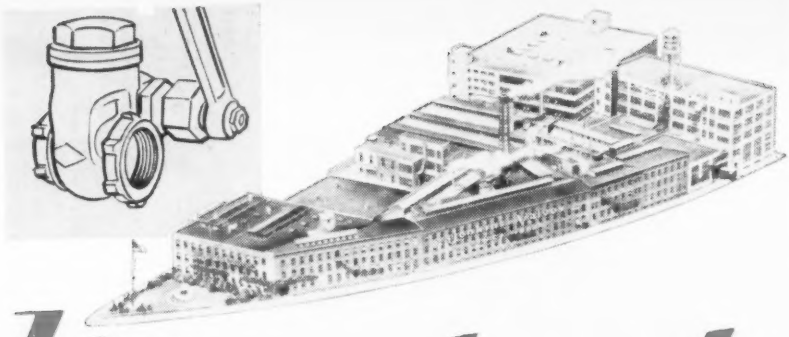
GREENSBORO • INDIANAPOLIS • MINNEAPOLIS • ST. LOUIS • WASHINGTON

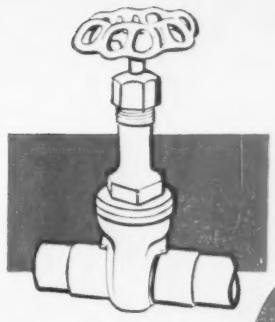
IRON ORE • PIG IRON • COAL • COKE



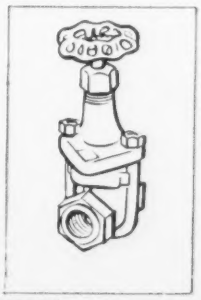
Quality starts

ROCKING action does it... better

Jenkins Bros. uses nine Detroit ROCKING Electric Furnaces to melt bronze for valves



in the furnace!



Top grade valves require top quality castings. And top quality castings require metal that is precisely right.

Jenkins Bros., makers of fine valves for almost a century, have 9 Detroit Rocking Electric Furnaces, with a combined capacity of 7700 lbs. per hour, to melt bronze of the necessary high quality.

PRECISE CONTROL OF ANALYSIS

Melt-analysis can be controlled very exactly in these great furnaces, with metal of the desired characteristics produced in heat after heat. Accurate temperature control allows establishment of the most advantageous pattern for operation, and duplication of that pattern for each melting cycle. The rocking action of the furnaces assures homogeneous melts and a more complete utilization of generated heat because of the flow of molten metal back and forth on the lining.

NOTE THESE ADVANTAGES

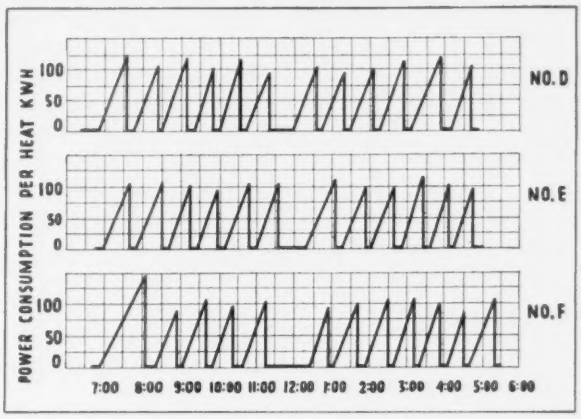
Other important advantages of Detroit Rocking Electric Furnaces are economy of power consumption, minimum heat loss, less metal shrinkage, fewer scrap castings, more heats per shift or working day, reduced out-of-production time because of long refractory wear and simple shell replacement, trouble-free operation.

Detroit Electric Furnaces range from 10 lbs. to 4000 lbs. capacity, individually designed to fit your plant's electrical specifications. They melt ferrous and non-ferrous metals with equal efficiency.

GET FULL INFORMATION

For full information on the advantages of Detroit Electric Furnaces for your foundry, send us your operating data. We'll give you full details. Write today.

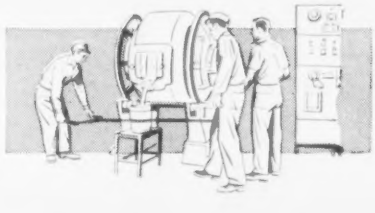
OPERATING RECORDS OF 3 JENKINS BROS. FURNACES



Each furnace melted 4½ tons of bronze in 10½ hours. KWH consumption respectively, 1312, 1272, 1269.

DETROIT ELECTRIC FURNACE DIVISION
KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.



melts, faster melts

Why *Brass* can better serve your needs

Handsome APPEARANCE

BRASS OR BRONZE ORNAMENTAL WORKS RETAIN THEIR LASTING BEAUTY . . .

Designers of ornamental works have long recognized the beauty of Brass and Bronze. The inherent qualities of these alloys lend themselves for the manufacture of name plates, statues, plaques, doors and the like. The architect and builder know that there is no substitute for Bronze when lasting beauty is essential.

FREE . . . Write for your copy of the 8-page Lavingot Technical Journal — Vol. 8, No. 2 — containing an article discussing "Refining Secondary Copper Alloys."

Specify—LAVIN NONFERROUS INGOT—*Quality*

Brass · Aluminum · Bronze · Zinc Base Die Casting Alloys

R. LAVIN & SONS, INC.

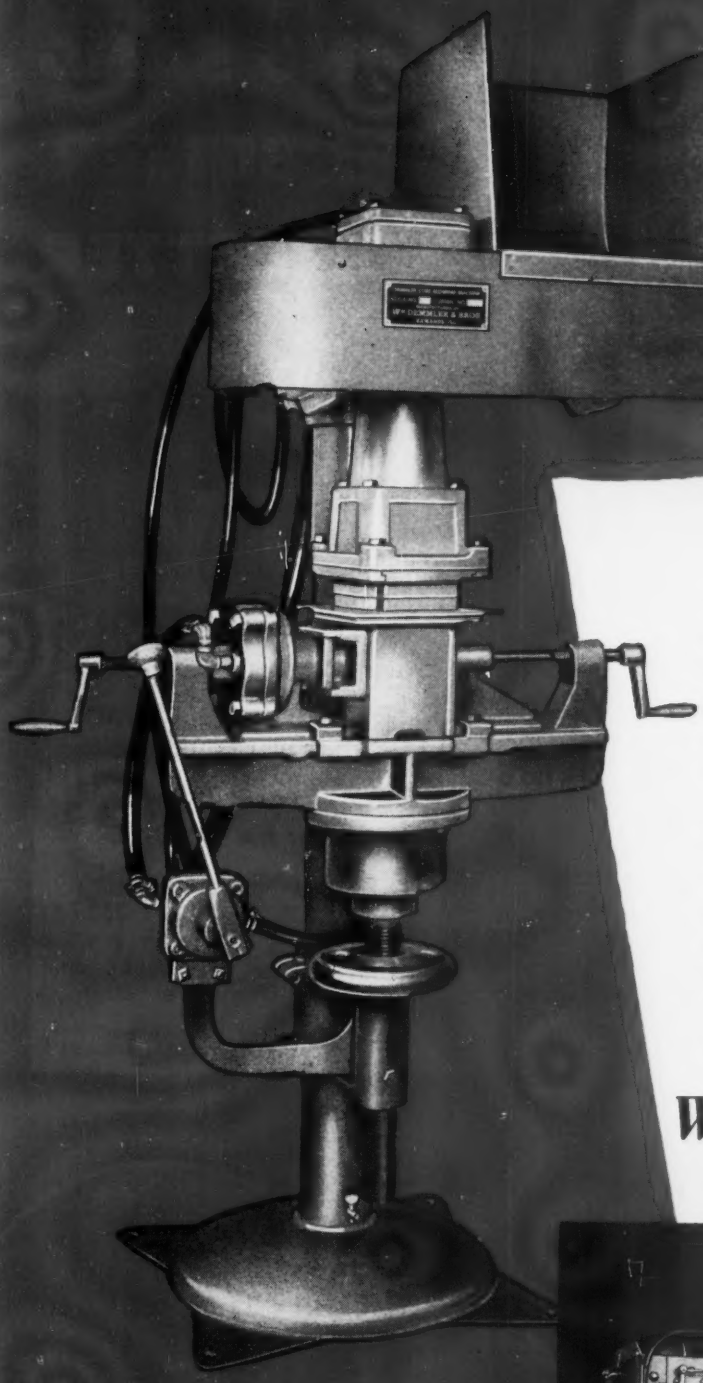
- *Refiners of Brass, Bronze and Aluminum*
- *Producers of Zinc Base Die Casting Alloys*

3426 S. KEDZIE AVENUE • CHICAGO 23, ILLINOIS

REPRESENTATIVES IN PRINCIPAL CITIES

R. LAVIN & SONS, INC. 1900 52 Years 1952 SERVING THE FOUNDRY INDUSTRY

Profits Multiply...



DEMMLER
NO. 55

MANUFACTURERS OF CORE BLOWERS
EXCLUSIVELY SINCE 1911

DEMMLER
CORE BLOWERS

OFTEN COPIED — NEVER EQUALLED

Join the thousands who depend upon DEMMLER Core Blowers to assure them greater profits through an efficiency that sets the standards for the industry.

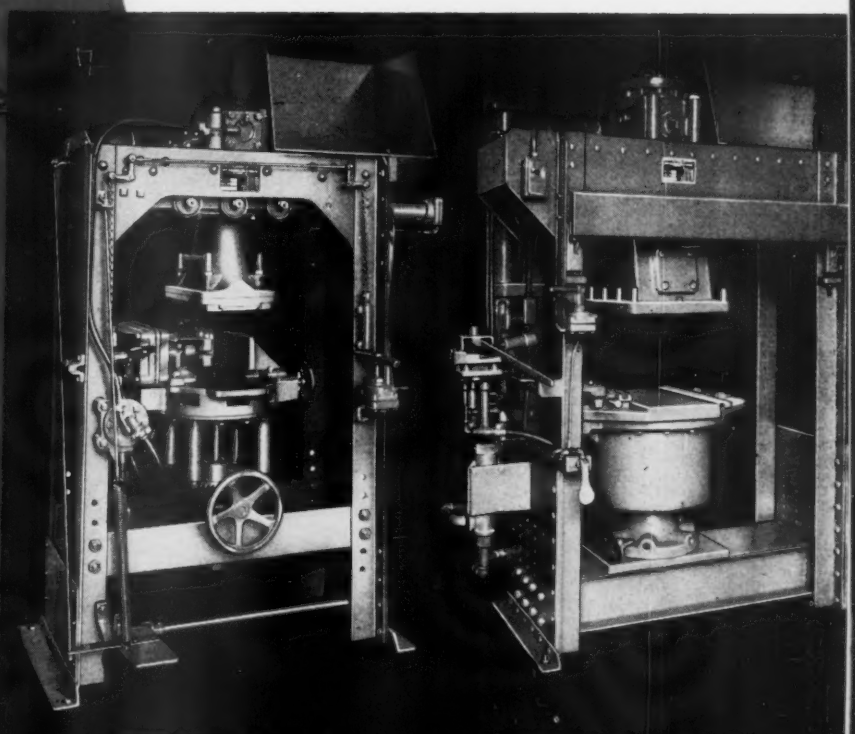
DEMMLER Core Blowers have led the field for over 40 years. They are often copied—never equalled!

Little wonder that Foundrymen have come to expect outstanding performance and matchless quality from every core blower bearing the familiar DEMMLER name. There's a machine to meet every core blowing requirement.

A letter stating your needs will bring descriptive literature promptly. Write today!

Wm. DEMMLER *& Bros.*

Kewanee, Illinois



DEMMLER NO. 1

DEMMLER NO. 3E

PROOF MOLDING SAND FLOWS BETTER, PACKS BETTER

WITH HERCULES® NVX

These unretouched photographs show that Hercules NVX in green sand facing assures foundrymen of firmer, denser molds with high resistance to metal penetration.

Note the deep, clean draw—the smooth, solid packing—the absence of soft pockets and porous spots. The superior working quality you get with NVX makes it useful in all facing sands, whether molding is by squeezer, jolt, or hand ram on the side floor.

We'll be glad to send you 100 lbs. of NVX for testing, at the 1,000-lb. quantity rate, together with technical data.

HERCULES POWDER COMPANY
INCORPORATED

Naval Stores Department, 920 King Street, Wilmington 99, Delaware

NF52-3

How Much EXTRA Are You Paying For Cores?

40 kw, 150,000 Btu *Foundromatic* dryer shown in high production foundry.

CHECK THE SAVINGS others are getting using the *Foundromatic* core dryer. It will pay you to find out what it can do for you in your foundry.

It's time you enjoy savings like these, too:

- Handling time cut 60-80%! Cores are placed directly on the moving conveyor belt of the dryer by the coremaker. In a few minutes they come out — cool enough to handle with bare hands — ready for the molder.
- Drying time cut 80%! Cores are dried in minutes instead of hours.
- Fuel cost cut 60%! All the heat goes into the core. In addition, unit can be shut off when not in use.
- Rejects reduced! Overbaking of cores and burning of fins and thin sections are eliminated.

If you investigated dielectric sand core drying a few years ago and decided that it wasn't ready, it's time you investigate again. Progress has been great. Seldom do you have the chance of enjoying such spectacular returns on your investment.

Call your nearby Allis-Chalmers district office for new booklet, or write Allis-Chalmers, Milwaukee 1, Wis.

A-3725

Foundromatic is an Allis-Chalmers trademark.

ALLIS-CHALMERS

QUESTIONS and ANSWERS

About Dielectric Sand Core Drying

1. *How does the core dry?*
By passing high frequency currents through the moist sand, the molecules are set in motion and the resultant friction generates sufficient heat to drive off the moisture from the inside.

2. *Why are resin binders used in place of core oils?*
Core oils require high temperatures and long drying time for complete polymerization. Resin binders cure at lower temperatures... approximately 250° F.

3. *What about collapsibility?*
Resin bonded cores have very good collapsibility, contributing to a faster, cleaner shakeout.

4. *I want a very hard core, but still have good collapsibility. What do I do?*
Spray the cores with a film of moisture just before putting on conveyor belt. This will give high surface hardness without affecting the collapsibility.

5. *Can core wash be eliminated?*
In many cases, yes. The resin forms a reducing atmosphere resulting in smooth castings, without necessity of applying core wash.

6. *Is any special or additional equipment needed?*
None, except plastic dryers to hold shaped cores. Marinite or transite plates are recommended.

7. *Can metal dryers or plates be used?*
Yes, but it will result in reduced production. The metal will act as a shield around the sand, requiring the core to be run a second time without the dryer or plate.

8. *I have metal dryers which I do not want to replace at once. Can I use them?*
Yes. Run the cores through in the normal manner. Turn the cores out on plates and remove the dryer and run the cores through again.

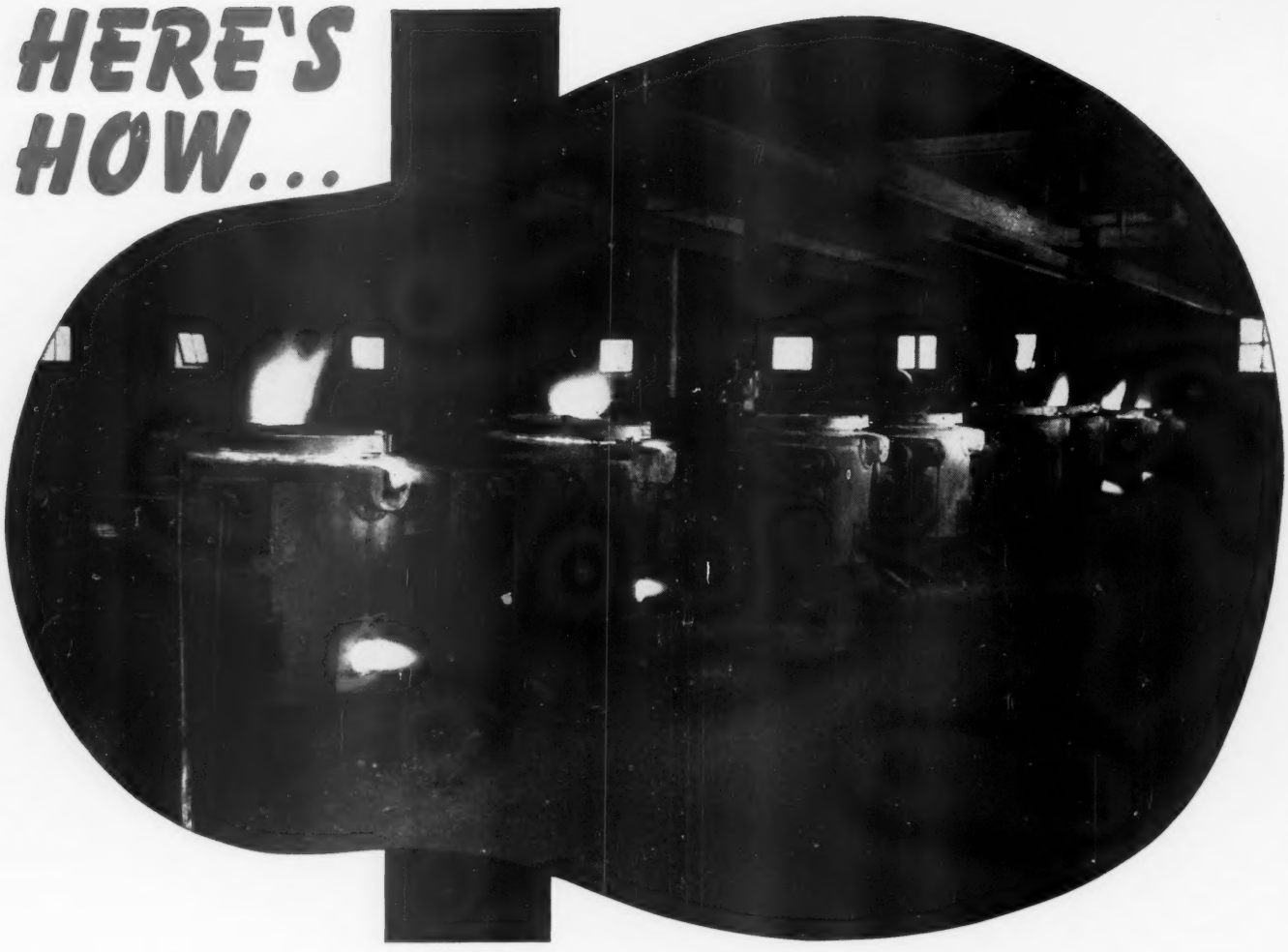
9. *How many plastic dryers will be needed?*
Far less than the normal amount of metal dryers. A maximum of 50 plastic dryers should suffice for each job unless more than one coremaker is working on the same job.

Allis-Chalmers
Milwaukee 1, Wisconsin

Please send me new 8-page booklet 15B7306B containing complete information on the *Foundromatic* sand core dryer.

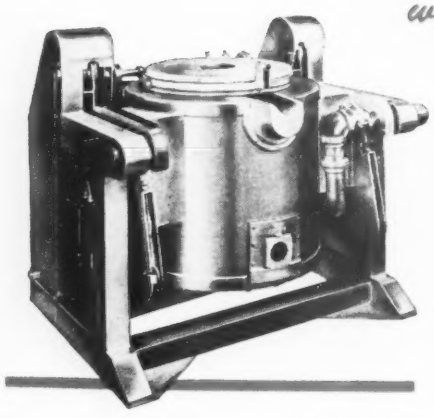
Name .....
Title .....
Company .....
Street .....
City ..... State .....

HERE'S HOW...



LINDBERG-FISHER TILTING FURNACES DOUBLE PRODUCTION....

with half as many furnaces - at 39% lower fuel cost!



See your Lindberg-Fisher man for full details, or write for Bulletin No. 57-A.

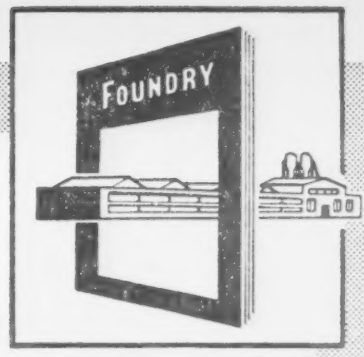
Hammond Brass Works, Hammond, Indiana, manufacturers of fine bronze, valves and fittings, recently installed 6 Lindberg-Fisher constant-arc nose pouring, gas fired, tilting furnaces for their melting and pouring operations. They have operated these furnaces for more than 6 months, 8 hours a day, 5 days a week. Their experiences show greatly increased production, reduced production costs, with safer and cleaner operating conditions.

Hammond Brass Works reports that small, obsolete furnaces were replaced with half as many large, modern Lindberg-Fisher mechanized tilting furnaces. The number of necessary heats per day was reduced one-third while double the quantity of molten metal was handled. Fuel consumption per lb. of metal was reduced 39%, labor cost per operation was lowered and crucible life increased from 65-70 heats to an average of 95-100 and up to 200 heats per crucible. Clean-up time has been reduced and maintenance problems simplified—resulting in a safer, cleaner operation, and raised employee morale.

Fisher Furnaces

A DIVISION OF LINDBERG ENGINEERING CO.

2453 West Hubbard Street, Chicago 12, Illinois



Dear Reader:

This page has been provided for your convenience. Use one of the return cards below for more information on advertisements in this issue of **FOUNDRY**.

Write the name of the advertiser and the page number of the ad in the spaces provided. Check the type of information you want. After you have finished going through this issue of FOUNDRY and have jotted down all of the ads on which you'd like more information, just tear out the card, drop it in the mail. We'll do the rest.

Our staff will forward this information to the advertiser immediately so you'll be relieved of the necessity of writing several letters. You'll hear from the advertiser directly, answering your request.

FOUNDRY
Readers Service

FIRST CLASS
PERMIT No. 36
(Sec. 34.9 P.L.&R.)
Cleveland, Ohio

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

4c POSTAGE WILL BE PAID BY—

FOUNDRY
Penton Building
Cleveland 13, Ohio
Readers Service Dept.

Please send further information on the following advertisements in this issue:

PAGE NO.	NAME OF ADVERTISER	Send Technical Data	Send Price Information	Nearest Source of Supply
		○	○	○
		○	○	○
		○	○	○
		○	○	○

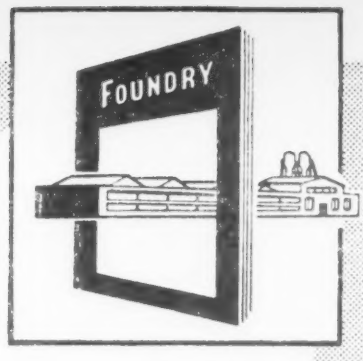
YOUR NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

FDY 7-52



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YOUR NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

FDY 7-52

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4c POSTAGE WILL BE PAID BY—

FOUNDRY
Penton Building
Cleveland 13, Ohio
Readers Service Dept.

FOUNDRY
Readers Service

Simplest Production-Booster you ever saw!

Typical installation of Foxboro Air Weight Control . . . readily adaptable to either a centrifugal blower (shown in diagram) or a positive displacement blower.

Controlling cupola blast by **weight of air** cuts pigging, ups quality, gives uniform pours

There's no longer any need to let the weather upset your cupola operation. With a Foxboro Air Weight Controller you can get uniform pours, *every day.*

The Foxboro Air Weight Controller automatically and precisely controls cupola air blast by weight — delivers the correct amount of oxygen for the quantity of coke in the charge. Regardless of ups and downs in atmospheric pressure or temperature, this simple, inexpensive accessory compensates for every change—insures better combustion, more uniform heats, and saves pigging.

All you do is set the control pointer before you start the run. No further attention is necessary. Air weight is held constant as long as desired, or may be changed instantly for pours of different composition. Installation on your present blowers easily made by an experienced pipefitter.

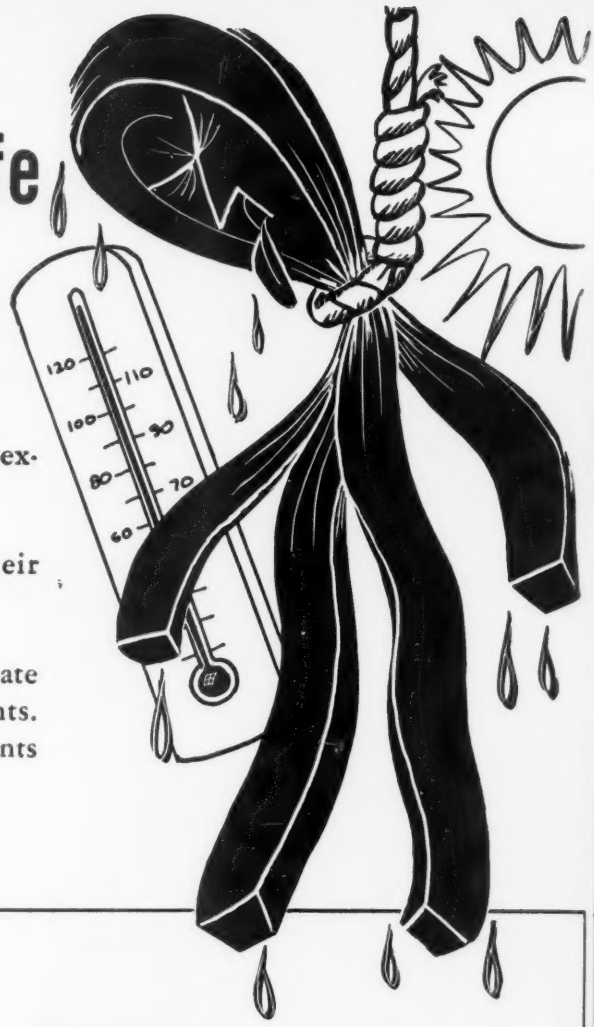
Foxboro Air Weight Controllers are used by more than 1000 foundries. Write for Application Engineering Data Sheet 330-6, and Bulletin 268-3. The Foxboro Company, 327 Neponset Ave., Foxboro, Mass., U.S.A.

FOXBORO REG. U. S. PAT. OFF. **AIR-WEIGHT CONTROLLERS**

FACTORIES IN THE UNITED STATES, CANADA AND ENGLAND

How to get More Life out of V-Belts

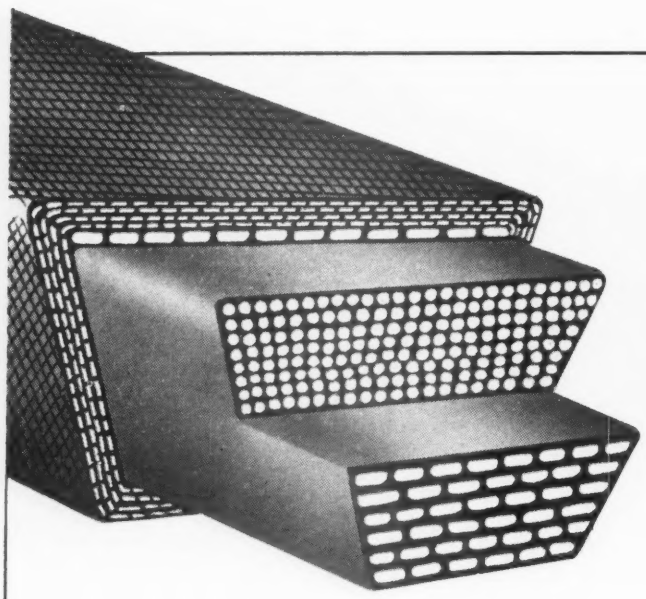
(STORAGE)



DON'T store V-Belts in a hot dry room or expose to the direct rays of the sun.

DON'T hang belts in such a way that their shape will be distorted.

DO specify and store *Bull Dog V-Belts* in adequate supply for your normal replacement requirements. With Bull Dogs on the job "normal" replacements are few and far between.



Your BWH distributor will be glad to show you how Bull Dog V-Belts have the covers, the cords and the compounds to cut *your* belting costs. Call him today.

HERE'S WHY

Their DURABLE COVERS withstand the severe wearing action of the sheave while sealing the belt against grease, dirt, moisture.

There's MINIMUM STRETCH due to a new, exclusive technique which results in fewer takeup adjustments, reduced slippage, longer belt life.

There's a STRONG, SPECIALLY ENGINEERED CORD SECTION with high tensile strength, increased load carrying capacity, ability to absorb shock loads.

The belt TAKES HEAVIEST FLEXING because BWH quality-controlled compounds run cooler and do not crack or deteriorate under severe flexing.

BWH DEPENDABLE RUGGEDNESS

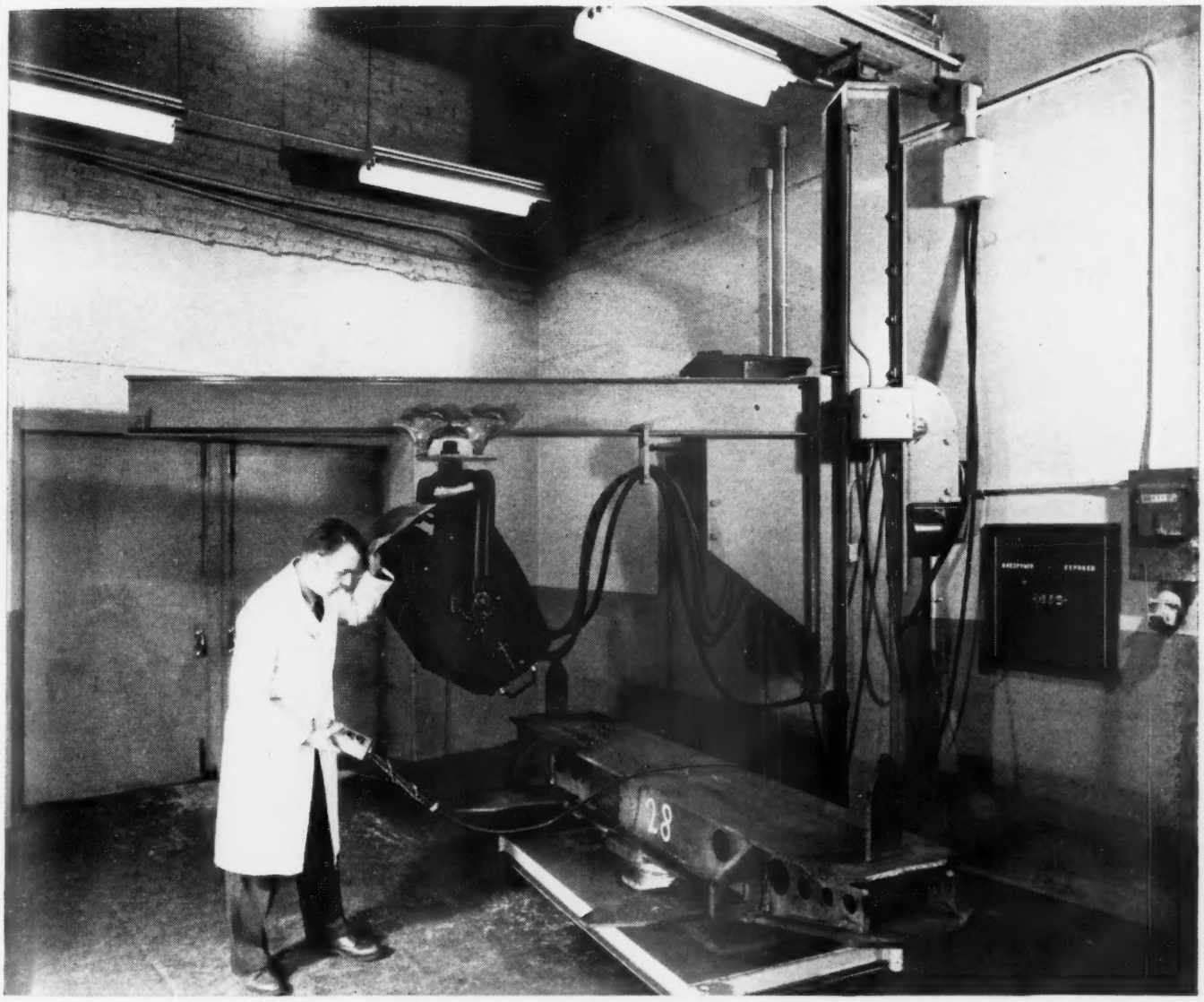
Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Warehouse Stock: 111 N. Canal St., Chicago, Illinois **Distributors in all Principal Cities**

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.

Here's PROOF that X-Ray cuts costs, speeds production



Scores of industries use non-destructive x-ray inspection to lower costs, speed production, improve products. Here are just a few typical* reports:

"Examination of one type of crankshaft showed lack of fusion at the chill . . . pointed the way to saving $250,000 on a year's production."

"It is estimated that on two jobs alone the foundry saved over $13,000 and added to its prestige by delivering castings in which the customers could have utmost confidence."

"Through the use of x-ray, risers have been added, relocated, reduced and even eliminated on many patterns, which in turn has made it possible to produce better castings at lower cost."

"Radiography accounted for the salvaging monthly of $35,000 worth of parts, enabling the foundry to increase its yield and pass on a 20% saving."

"The only reliable way of detecting internal tears is by radiography. On a radiograph the internal hot tear will show branches emanating from the main crack."

The GE model OX-250 is by far the world's most popular industrial radiographic unit. With an operating range from 60 to 250 kvp, 2 to 10 ma, this versatile unit is available in seven different mountings to meet varied industrial needs.

Let one of General Electric's highly trained application specialists appraise your inspection needs. Ask for the new 28-page information book, Pub. 7A-3292, from X-Ray Department, General Electric Company, Milwaukee 14, Wisconsin, Rm. YY7.

*Names supplied on request.

GENERAL ELECTRIC

FABREEKA

Under Molding Machines

REDUCES THE EFFECTS of heavy impact shock and destructive vibration . . .

FABREEKA PADS, Bushings and Washers are installed under Molding Machines, Shakeout Machines, Tumbling Barrels and other heavy machinery to reduce the effects of heavy impact shocks and destructive vibration.

FABREEKA has demonstrated its ability to prevent breakage of machine parts and to keep bolts tight, thereby reducing maintenance and increasing production.

FABREEKA has long life, and this important advantage makes its final cost a low cost.

Write for latest literature

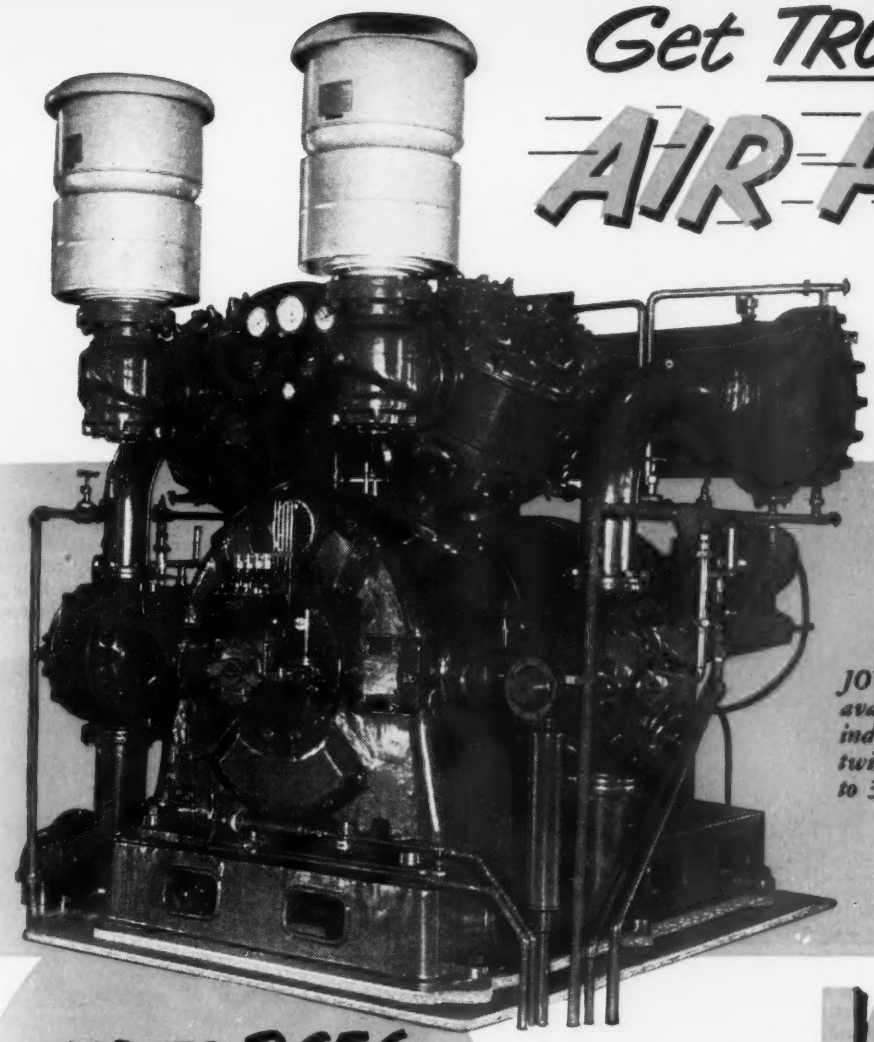
FABREEKA

PRODUCTS COMPANY, INC.

222-B SUMMER STREET, BOSTON 10, MASSACHUSETTS

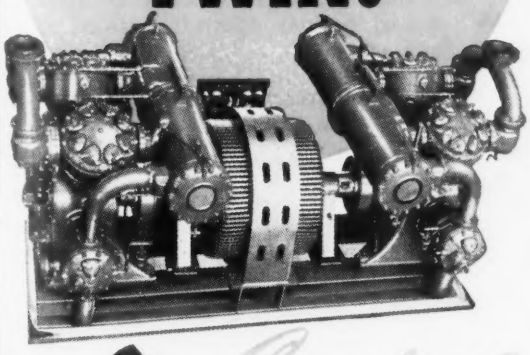
NEW YORK · CHICAGO · DETROIT · SPARTANBURG
PHILADELPHIA · PITTSBURGH · OAKLAND

Get TROUBLE-FREE AIR-POWER at ROCK-BOTTOM COST!



JOY Series 100 compressors are available in two and four cylinder models and in single and twin units. Capacities from 378 to 3656 c.f.m.

UP TO 3656 C.F.M. in a TWIN!



with a JOY PACKAGE TYPE HEAVY DUTY WN-114 COMPRESSOR

Install it, start it,—then forget it! That's what you can do with a JOY compressed-air power unit, because it's built to give constant, dependable service 24 hours a day, year in and year out. JOY Series 100 Air Compressors are two-stage, double-acting, heavy duty, continuous service compressors—much smaller than old style compressors of the same capacity, yet with operating economies exceeding those of the older, bulkier units. JOY *pioneered* the compact, modern, "package-type" compressor.

All wearing parts are replaceable on the Series 100—the finest air compressors you can put on the job. ● *Let us give you full details on the size that fits your air-power requirements.*

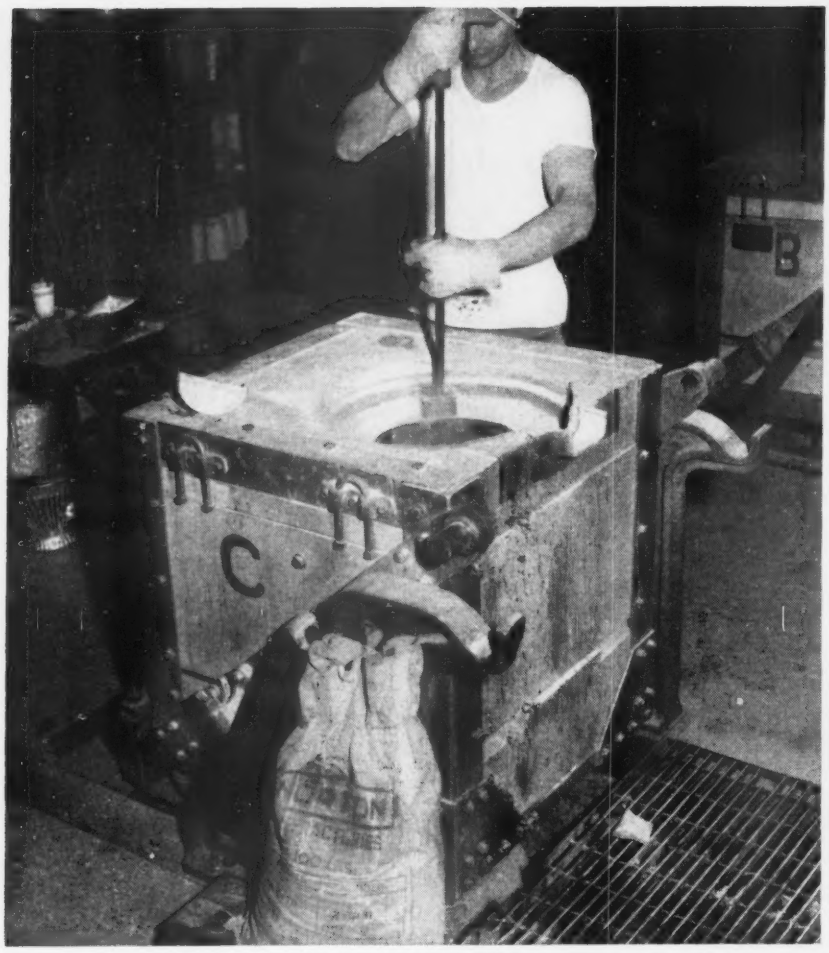
Over 100 Years of Engineering Leadership

W&D : 3513

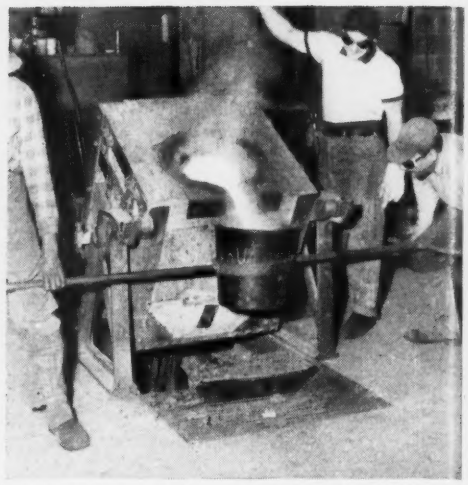
JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

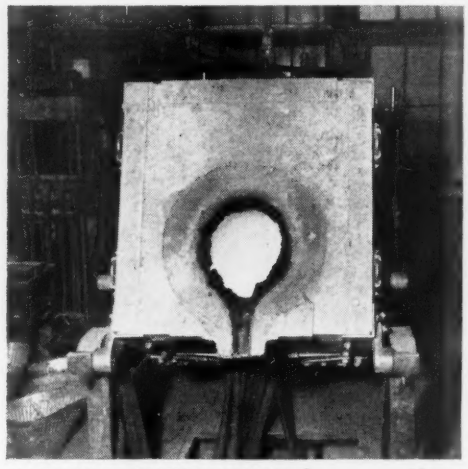
IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO



RAMMING Norton MAGNORITE cement lining into an Ajax 500-lb. high frequency induction furnace. This cement has been developed specifically to be dry rammed and will withstand temperatures up to 3250 F. It provides densest possible lining for resistance to metal penetration and erosion.



MOLTEN STEEL is here poured into ladles. Due to the employment of fractional tapping, cement lining must withstand much longer periods of holding melt at pouring temperatures. Highly refractory Norton MAGNORITE cement insures long life and low maintenance cost even under these conditions.



MAGNORITE CEMENT LINING shows no evidence of erosion or chemical attack after metal has been completely poured, thus assuring minimum repairs. This cement is designed to have a slight expansion upon maturing to eliminate shrinkage cracks which might lead to furnace failure.

Melt more metal per lining

with Norton Refractory cements

You'll get long life, low maintenance cost from your furnace linings by using Norton refractory cements. *You'll melt more metal per lining.*

These cements are available in a variety of refractory compositions designed to meet your individual needs. *Norton MAGNORITE* cement*, for instance, is used in high frequency furnaces for a wide variety of melts, ranging from straight steels to heat-resistant compositions. *Norton FUSED STABILIZED ZIRCONIA* crucibles are excellent for melting platinum and its alloys. This sensational refractory is not wetted by the metal, permitting 100% recovery of the melt without destroying the crucible. *Norton ALUNDUM* and MAGNORITE* crocks, covers, and cements are used successfully in indirect arc furnaces. These cements are also used in low frequency furnaces for melting such refractory alloys as cupro-nickel and nickel silver; high copper alloys and Al, Te, and Si bronzes. *ALUNDUM* cement is also excellent for handling stainless steel.

For heat-treating and sintering furnaces investigate ALUNDUM and CRYSTOLON* hearth plates, pier brick, burner blocks, muffles, muffle plates, skid rails, recuperator tubes, burner-tunnel, and embedding cements.

Whatever your problem, you can depend on satisfactory solution when Norton research engineers Norton refractories to fit your exact requirements. For further information, see your nearby Norton representative — or write direct to NORTON COMPANY, 304 New Bond Street, Worcester 6, Mass. *Canadian Representative:* A. P. Green Fire Brick Co., Ltd., Toronto, Ontario.

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Special REFRACTORIES

Making better products to make other products better

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Completely New and Proven Operating Principle

Custom built in any Length, Width or Depth

ADAMS ALUMINUM EASY-OFF FLASK

These advantages will cut your production costs!

RIGID CONSTRUCTION through proven corner design, permits reduced weight without the loss of maximum strength.

SOLID CORNERS are of the same design used on Adams Aluminum Slip Flasks. This interlocking tongue-and-groove construction is retained in perfect alignment with bolts secured through tapped end sections and locked with washers and nuts. Important! This construction has proved superior to other forms of corner design.

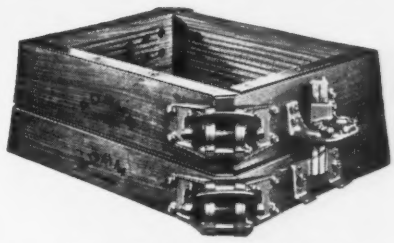
MALLEABLE TRIMMINGS are used on Adams Aluminum Easy-Off Flasks as on all other flasks we manufacture.

OPERATING MECHANISMS are identical with those used on the Adams Cherry Easy-Off Flask and incorporate the same simple adjustment and reversal of locking position.

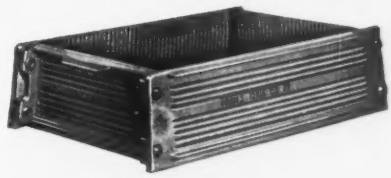
ADJUSTMENTS are made only when the mechanism is in locked position.

ALUMINUM PROTECTING STRIPS are standard equipment at top of cope and bottom of drag. Steel strips available upon request at no extra charge.

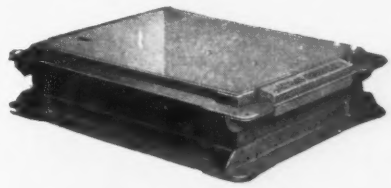
HANDLES AND TRUNNIONS are available when specified . . . at extra charge.



Adams Cherry Easy-Off Flask



Adams Jackets, Cast Iron or Aluminum



Adams Steel Jacket

• ***Write today for full details . . .***

Cherry Snap Flasks—Cherry Slip Flasks—Aluminum Slip Flasks—Easy-Off Flasks
Cherry Presser Boards—Wood Bottom Boards—Steel Bottom Plates—Steel Jackets
Aluminum or Cast Iron Jackets—Steel Bands—Steel Upsets—Cherry or Aluminum Upsets

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ESTABLISHED 1883

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"The Story of CASTFLUX"

Have you tried the new, improved CASTFLUX SB-10 *...the increased efficiency is available at no extra cost!*

New, impoved CASTFLUX SB-10 is a DUAL PURPOSE FLUX, a partly exothermic compound for feeding heads and risers that virtually DOES NOT SMOKE OR CREATE FUME. There is ABSOLUTELY NO CARBON PICK-UP at the neck of the riser or casting itself. It keeps the "pour" hot and liquid for periods of 100% to 200% longer. As a ladle addition it is a wonderful liquidizer—through its cleansing action it de-oxidizes and de-gasifies the metal. It has been universally accepted by the industry for its metallurgically controlled "batch-uniformity". That it increases the yield and improves production at considerable savings has been conclusively proven. You, too, can benefit by a test-trial!

unconditionally GUARANTEED

*Unless CASTFLUX SB-10 meets with your full approval, material can be returned at no expense within 30 days.

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with Branches in
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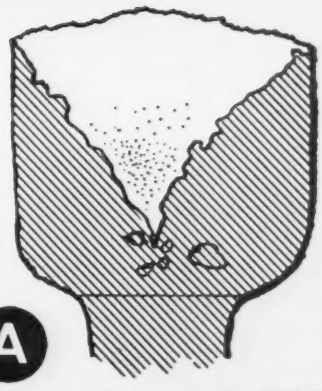
lew, improved CAST-LUX SB-10, the anti-lping compound proven so revolution-ry in its advantages, as become standard sage in foundries and eel mills the world ver, in securing the ighest average result n maximum pipe limination.

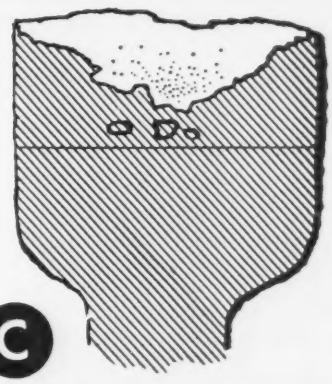
low you can pour sers short . . . save on melting cost with ss fuss and bother .. secure more, sound, nd shrinkage-free astings, regularly. sually it requires only 0% to 65% of CAST-LUX SB-10 to do the b better with greater sults.

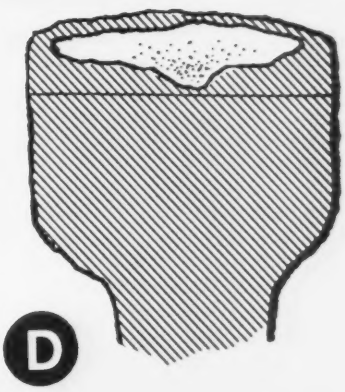
Which type A - B - C - D is the average result in your foundry?



secure high average in maximum pipe elimination in both iron and steel risers and hot tops —

switch to CASTFLUX SB-10 and get more of the -C-D-TYPE!





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-10 is stocked by the following distributors in your market:

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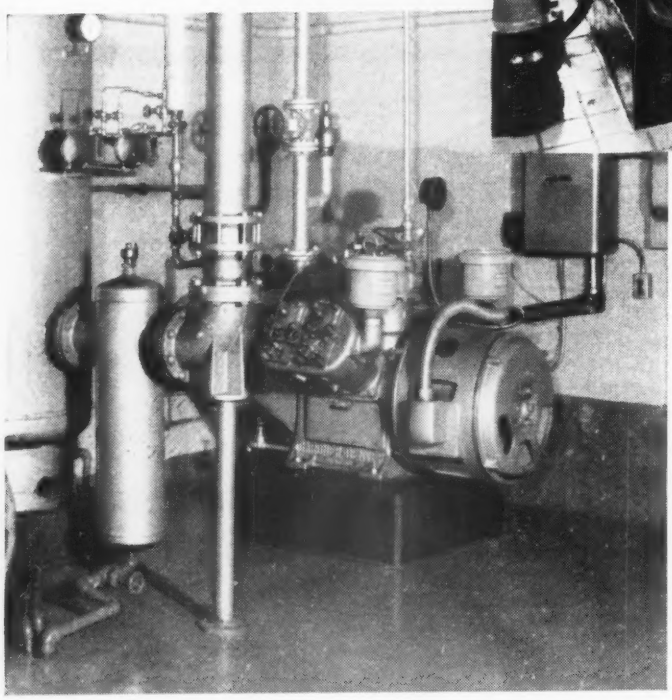
Sized to fit!



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Rugged, heavy-duty power end, fully enclosed.

Double row Timken tapered roller main bearings.

Unusually large water jackets for effective cooling.

Duo-Plate "Air-Cushioned" valves — quiet, durable and efficient.

Capacities from 468 to 1854 cu. ft. displacement per min.

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Fully water-cooled compressor cylinders.

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Write for Bulletins HAC-36 and WB-10.

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THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

3 cost-cutting reasons

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1. In Norton CRYSTOLON wheels you get an abrasive with just the right hardness and sharpness for fast, economical grinding on a low-tensile-strength material like gray iron.

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YOUR NORTON DISTRIBUTOR CAN HELP YOU

Besides his own practical experience in grinding applications, your Norton Distributor can always call in a Norton Abrasive Engineer. They will be glad to study your grinding jobs and make recommendations for more efficient, more economical cleaning room operation.

Many Money-Saving Tips on the grinding jobs you're doing right now are contained in this 54-page illustrated booklet. Ask your Norton Distributor for Booklet 1405, or write us direct. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Inc., Worcester 6, Massachusetts.

NORTON
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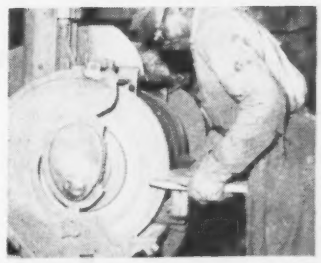
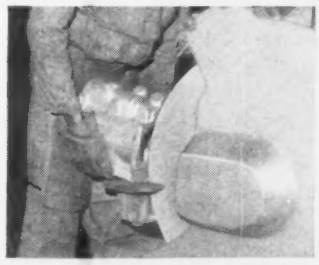
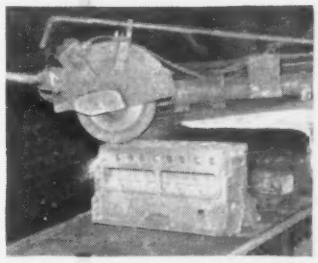
Making better products to make other products better







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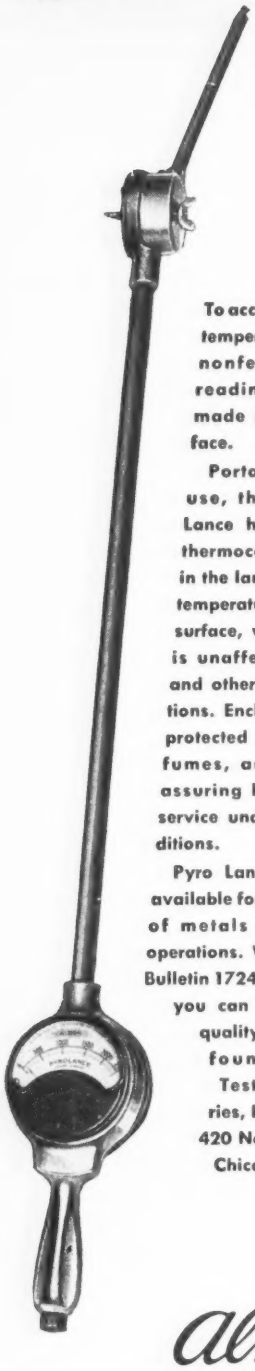
in nonferrous foundries
SURFACE INDICATIONS CAN BE
MISLEADING



To accurately measure temperature of molten, nonferrous metals, readings should be made *below* the surface.

Portable, handy to use, the Alnor Pyro Lance has a protected thermocouple mounted in the lance tip—it takes temperatures below the surface, where accuracy is unaffected by dross and other surface conditions. Enclosed couple is protected against flame, fumes, and corrosion, assuring long, accurate service under severe conditions.

Pyro Lance models are available for a wide variety of metals and foundry operations. Write today for Bulletin 1724-D and see how you can have low-cost quality control in your foundry. Illinois Testing Laboratories, Inc., Room 511, 420 North LaSalle St., Chicago 10, Illinois.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

Readers' COMMENT

Electric Furnace Iron

TO THE EDITORS:

In your March issue, page 117 there is a question "Melt Iron in Electric Furnace." Your answer is in general correct but somewhat incomplete. We have many years of practical experience in that field and a description of our practice may be useful.

We operate a basic-lined (magnesite) furnace and acid roof (silica). An all-silimanite lining and roof seems to be better but is too expensive in this country. The charge consists of one third light and medium steel scrap, one third dynamo sheet stampings, partly loose and pressed, and one third steel and gray iron borings. Coke addition to the charge is about 6-8 per cent of the iron; and is composed of one-half petrol coke and one-half fine coke breeze. Two-thirds of the coke (larger pieces) are charged first on the bottom, the rest (fine material) is thoroughly mixed with the fine part of the iron charge and put on top of the scrap. Some lime and fluorspar are added to give a suitable slag. This practice is very important in order to get a carbon content of 3.4 per cent as we use it.

Melting is as usual with steel and when the charge is fluid a test block is analyzed for carbon and silicon. This is essential as we find charges with 2.7 up to 3.9 per cent C. We believe that a hot furnace and quick melting have a tendency to give higher carbon pickup. To compensate we charge more coke in the first heat on Monday morning. After slagging the carbon and silicon analyses are available and the necessary additions to control carbon and silicon are made. If C is too high, steel scrap is added; if too low fine petrol coke (low volatile matter is important). In most cases only a very small addition is necessary and we use some Ferrocarbo briquets. As they contain some Si, it is necessary to make allowance for such augmentation in the Si addition. Si is adjusted with FeSi, 75 or 90 per cent. If a large amount is necessary, one-half is charged in advance with the scrap.

Now the high power tap on the furnace is used to get a hot iron. In pouring very light castings (0.10-in.) a small addition of FeSi is made to the ladle to avoid mottled structure on the corners. For larger castings, 2-in. and more diameter, we add clean scrap in the ladle. This latter practice works well, but caution and exact calculation of the necessary addition is important.

From time to time the other components are analyzed. Sulphur is low, 0.02 per cent; Mn 0.4 per cent; and P 0.5 per cent. If necessary we add FeMn or FeP. Gates and runners are stored and remelted in the cupola to replace valuable pig iron. This is done in winter when electric power is scarce.

Greatest care must be taken to deoxidize the melt properly. A carbide slag, stirring the melt, and final addition of aluminum to the ladle give good results. We test every charge, sometimes every ladle in a vacuum chamber for gas content.

GERHARD BLUMER
Dipl. Ing.

Rorbas-Freienstein,
Switzerland

* * *

Dual Metal for Bushings

TO THE EDITORS:

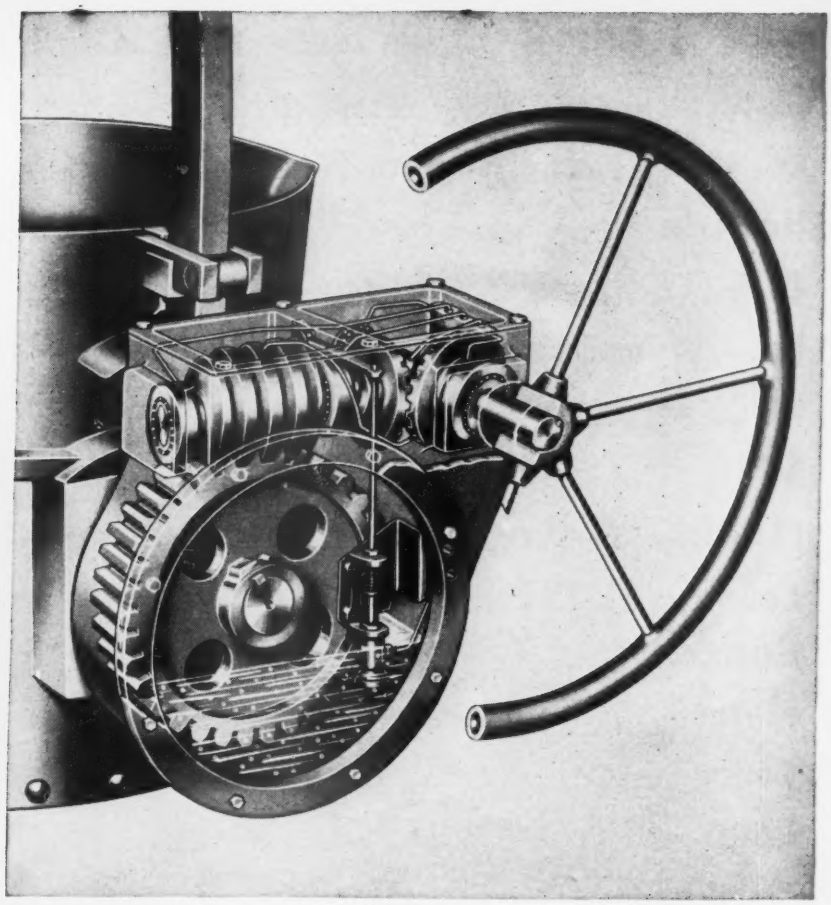
One of the subjects discussed in the "Questions and Answers" section of the March issue of FOUNDRY dealt with the possibility of dual-metal construction for dredge bucket bushings. The questioner was considering centrifugally cast construction with a tough alloy steel on the outer surface and martensitic white iron on the inner surface.

We do not agree with the answer that was supplied, for we feel that, first, such a combination would be feasible and, second, the martensitic white iron would give a wear life quite superior to that of 14 per cent manganese steel.

Our reason for stating that a dual-metal construction consisting of an alloy steel outer surface and a martensitic white iron inner surface is feasible, is that such composite structures are being commercially produced and successfully applied. A sound metallurgical bond can be obtained between adjoining layers of steel and iron of this type so that the resulting product is one possessing good metallurgical properties. The success of such a structure of course depends upon the service loads imposed upon the parts but, in the ques-

(*Concluded on page* 82)

This Worm Ladle Gearing ELIMINATES GASKET ADJUSTMENTS



. . . WORM AND BEVEL GEAR ASSEMBLY COMPLETELY ADJUSTABLE

Here is another Industrial Equipment Company first . . . new, improved worm ladle gearing bringing *complete universal adjustability.*

Take a close look at the phantom view. Here is a one-piece, self-contained unit with all parts easily accessible. Your maintenance man can quickly make back-lash adjustments to pin-point accuracy and positive adjustment by adjusting the bearing lock nuts on all gears and worm. These nuts are easily reached and with working space to spare.

Unaffected by Heat

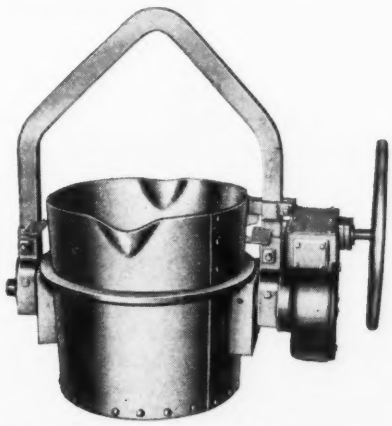
There is no connection between the bail and the gearing. No clearance for heat distortion is necessary, permitting an assembly almost to machine tool precision.

Industrial's new gearing is absolutely safe and positively self locking. The high ratio between worm and worm gear locks the ladle in any position. Incidentally, worm and bevel gears are of high tensile semi-steel and the worm is of high alloy steel. All are precision cut. Shafts are mounted on anti-friction bearings.

Now Standard Equipment

All Industrial geared ladles are now supplied with this outstanding new type of gearing. In addition, this gearing can be supplied for any Industrial worm geared ladles now in operation. *Write for details.*

- **Completely enclosed and self contained**
- **Automatic force-feed lubrication**
- **Positively self locking in any position**
- **Precision cut gears**



Model 592T ladle with new type gearing. Also notice use of Industrial Equipment's much talked-about UNIVERSAL BAIL. This bail completely eliminates binding due to heat distortion or misalignment.

Do you have our revised catalog No. 35?

Industrial
EQUIPMENT COMPANY
115 N. Ohio St., Minster, Ohio

LADLES • BOWLS • SHANKS • BAILS • TONGS • SPECIAL EQUIPMENT

SHOT & GRIT – "T" AND PERMABRASIVE – National Metal Abrasive Co. ★ Western Metal Abrasives Co. ★ ★ ★ COAL – Harlan-Wallins Coal Corp. ★ Hudson Coal Co. ★ ★ ★ COKE – Algoma Steel Corp. ★ Citizens Gas & Coke Utility ★ Ford Motor Co. ★ Wyandotte Chemicals Corp. ★ ★ ★ FERRO-PHOSPHORUS – Victor Chemical Works ★ ★ ★ SPIEGELEISEN – New Jersey Zinc Co. ★ ★ ★ FLUORSPAR – Crystal Fluorspar Co. ★ Minerva Oil Co. ★ ★ ★ FLUXES – DOLOMITE AND LIMESTONE ★ ★ ★ Hudson Coal Co. ★ ★ ★ COKE – Algoma Steel Metal Abrasive Co. ★ ★ ★ Western Metal Abrasives Co. ★ ★ ★ COAL – Harlan-Wallins Coal Corp. ★ Corp. ★ Citizens Gas & Coke Utility ★ Ford Motor Co. ★ Wyandotte Chemicals Corp. ★ ★ ★ FERRO-PHOSPHORUS – Victor Chemical Works ★ ★ ★ SPIEGELEISEN – New Jersey Zinc Co. ★ ★ ★ FLUORSPAR – Crystal Fluorspar Co. ★ Minerva Oil PIG IRON – Algoma Steel Corp. ★ Carnegie-Illinois Steel Corp. ★ ★ ★ SILVERY PIG IRON – Jackson Iron & Steel Co. ★ ★ ★ SANDS, CLAYS, REFRACTORIES – Albany Sand & Supply Co. ★ Eastern Clay Products, Inc. ★ New Jersey Silica Sand Co. ★ Standard Sand Co. ★ Standard Silica Corp. ★ Valley Dolomite Corp. ★ ★ ★ CHAR-COAL – LUMP, BRIQUETS – Cliffs Dow Chemical Co. ★ Ford Motor Co. ★ ★ ★ MILL AND FORGING SCALE ★ CINDER ★ SAJCO JACKETS ★ ★ ★

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Established 1890

(Concluded from page 80)

tion of dredge bucket service, we believe that these two metals can be used in a dual structure.

As far as comparative abrasion resistance is concerned, extensive field data covering many years of tests have shown that martensitic white iron will out-wear austenitic manganese steel over the range of 30-100 per cent, depending upon the actual service conditions. Factual data comparing these two materials are contained in many examples cited in our bulletin, "Engineering Properties and Applications of Ni-Hard."

K. A. DELONGE
Development & Research Division
International Nickel Co. Inc.
67 Wall St., New York 5

●

TO THE EDITORS:

Your "Questions and Answers" section of the March issue of FOUNDRY contained a reference to the possibility of utilizing a dual-metal centrifugally cast combination of an alloy steel shell lined with a metallurgically bonded Ni-Hard core. Your questioner asked if Ni-Hard could be substituted for 14 per cent manganese steel. It is our feeling that your answer to this question may be a little premature.

I should like to point out that in a considerable number of applications involving wear, Ni-Hard has proved superior to manganese steel and even to the hard facing alloys.

JOSEPH H. BUERGER
Sales Manager
Special Products Division
United States Pipe & Foundry Co.
Burlington, N. J.

* * *

Rare Earths

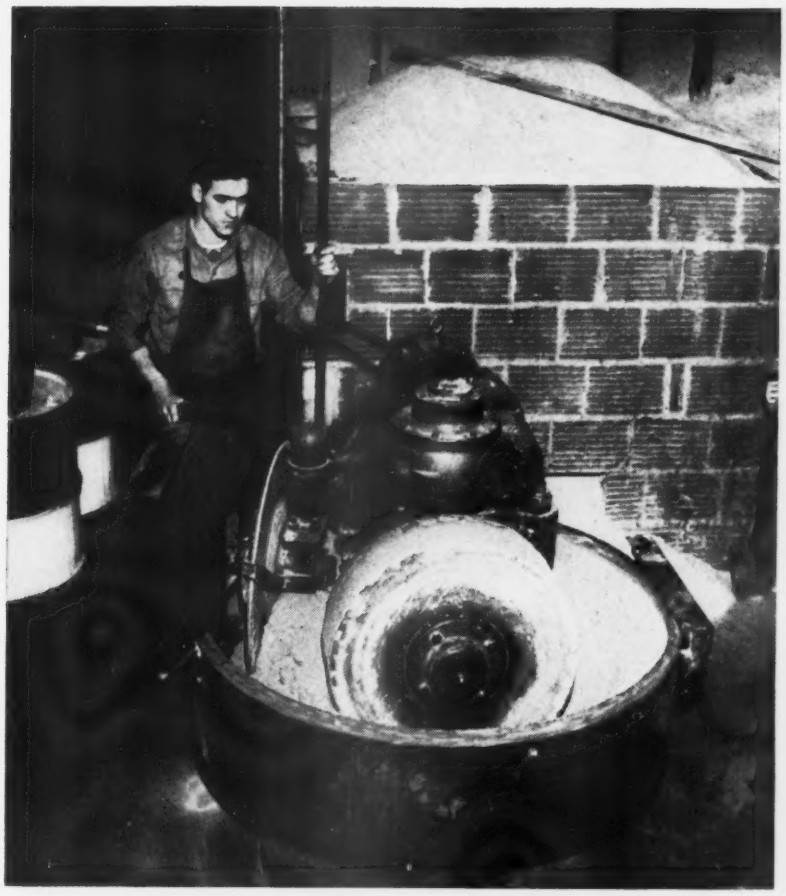
TO THE EDITORS:

Enclosed is our request for a subscription to your fine journal.

Our company has the only complete line of rare earth products for the metal industry. This line includes misch metal, rare earth fluoride and special products made to our specifications for certain applications.

The rare earths are used as inoculants in iron, for improved physicals in steel castings, for improved properties of magnesium at high temperatures, as well as for increased cleanliness in wrought steels and improved hot workability of high alloy grades.

J. H. CLARK
Sales Manager
Metallurgical Enterprises
P.O. Box 1, Station B
Buffalo 7



This No. 404 Clearfield Mixer has been in operation for eight years in the core shop of the Railway and Industrial Engineering Co. of Greensburg, Pa., makers of electrical switchgear for substations and generating stations. During that time it has required only very few minor repairs and "has paid for itself many times over."

in preparation of foundry sand

The CLEARFIELD mixer

"Pays For Itself Many Times Over"

By its speed, its dependability, its flexibility—by the high quality sand it turns out—the Clearfield Mixer cuts costs and speeds production. In the unsolicited words of one of our satisfied customers "it pays for itself many times over."

Clearfield Mixers, featuring the famous revolving pan principle, are available in a wide range of sizes. There is a Clearfield Mixer to meet any sand preparation requirement you have, either as a single process or part of an integrated system.

Write today for Catalog No. 79
for complete details.

CLEARFIELD
MIXER

**MIXES, TEMPERS
AERATES**

CLEARFIELD
MACHINE COMPANY

CLEARFIELD
PENNSYLVANIA, U. S. A

Sterling WHEELBARROWS for Your Foundry!

No. D4S — Tubular reinforced frame barrow for sand, scrap, etc. 4 cu. ft. capacity. 14 ga. tray.

No. D6S — Same as No. D4S above, but with 6 cu. ft. capacity, for coal and coke. 14 gauge tray.

Any Type of Wheelbarrow .... Now Available for PROMPT SHIPMENT!

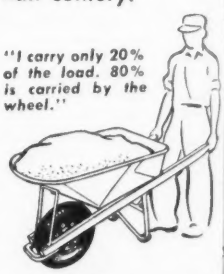
No. D8S — Tubular, reinforced frame barrow for coke, sawdust, shavings, and similar bulky materials. 14 ga. tray.

No. DF4S—Heavy duty barrow for extra hard foundry service. 3/16" plate supports front, back and bottom of tray. Tubular frame also reinforced. 14 gauge or 12 gauge tray.

Here's a simple way to solve your foundry hauling problems. Use Sterling Tubular Steel Handled Wheelbarrows or Barrows with wood handles made of select hardwood. They "fill the bill" . . . have long been known for their ability to withstand rough foundry usage . . . day after day . . . month after month. The all-welded Sterling tray is lapped at corners for double strength and is equipped with a continuous steel, butt-welded reinforcing rod around the top edge. And remember, Sterling Barrows are built by the same dependable manufacturer who has supplied you with Steel Foundry Flasks for almost a half century.

Choice of Wheels

Sterlings are available with Zero Pressure Cushion-type Wheel, Pneumatic-tired Wheel, or Plain Steel Wheel. All are interchangeable on any Sterling Barrow. Write for catalog.



Consult Sterling when in need of foundry flasks or other foundry equipment.

STERLING WHEELBARROW COMPANY • MILWAUKEE 14, WIS., U.S.A.

Sterling

Pioneers in the Manufacture of Foundry Flasks

A 7184-1PC

Let's Use What We Have

FOR nearly two years, slowness of the military to anticipate needs and freeze production schedules has left various civilian defense agencies with a feeling of frustration. Top personnel of the National Production Authority frequently complains of inability to find out what the military needs in the way of tools and materials, or when these things will be required. Too frequently, plans for military production are not transmitted to defense agencies until practically completed, and then, because all factors are not understood or recognized, stumbling blocks develop which leave industry confused and unable to render maximum service to defense production.

Program for building large presses to make aircraft parts provides one example. Original designs developed by the military called for larger steel castings than existing facilities could produce. When these facts became known to NPA and the industry, delays were necessary while revised designs were produced. Then, the Department of Defense, without accurate knowledge of what can be done in this country, sent so-called specialists scurrying to Europe to arrange for production of some very large castings there.

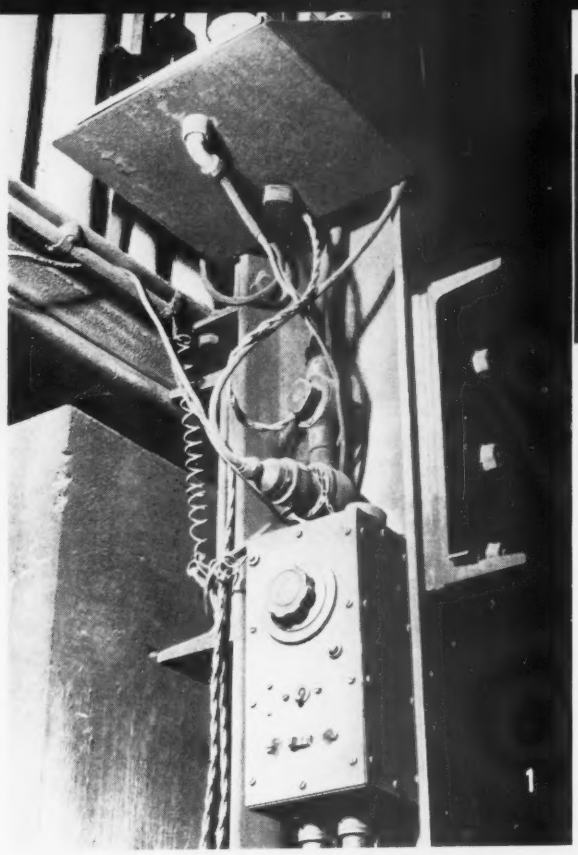
All of this confusion and delay, resulting from an appalling lack of information on the industries concerned, could have been eliminated if the military would work closer with industry on these production problems. A year ago the machinery for such co-operative effort was available to the military, but through lack of foresight it was discarded.

Shortly after World War II, a reactivated Munitions Board organized a large number of industry advisory committees. The foundry industry was one of the best organized, with a Foundry Industry Advisory Committee and eleven subcommittees representing each type of casting producer, and the fields of foundry equipment, supplies and technical progress.

Many of these committees, including all related to castings, had industrial representatives as chairmen. About 18 months ago, the Department of Justice, in its drive to make everything sweet and pure regardless of when defense production is achieved, ruled that only government employees could be chairmen of these advisory committees. From that time on the usefulness of these committees declined, and a few months ago they were abolished. Reasons centered around possible duplication of effort with industry committees of the NPA. But the fact remains that the Munitions Board and NPA committees serve two entirely different functions and there is no major duplication of effort.

To eliminate some of the procurement confusion, provide real advisory service to the military, and permit industry to do a job commensurate with its capabilities, the various advisory committees to the Munitions Board should be reactivated at once and put to early use. And the committee chairmen should be selected from industry. Let's use this nation's facilities and know-how to best advantage.

Frank G. Steinebach
Editor



Figs. 1-4—Features of the electronic d
vice used to assure addition of ferros
con to molten iron flowing down the spou
Figs. 1 and 2 show two views of the device
Fig. 3—Hopper and vibrator actuated by the
electronic instrument. The vibrator oper
ates only so long as cupola is being tapped
and metal passes in range of electric "eye"
Fig. 4—Circuit diagram for the instrument

DEVICES

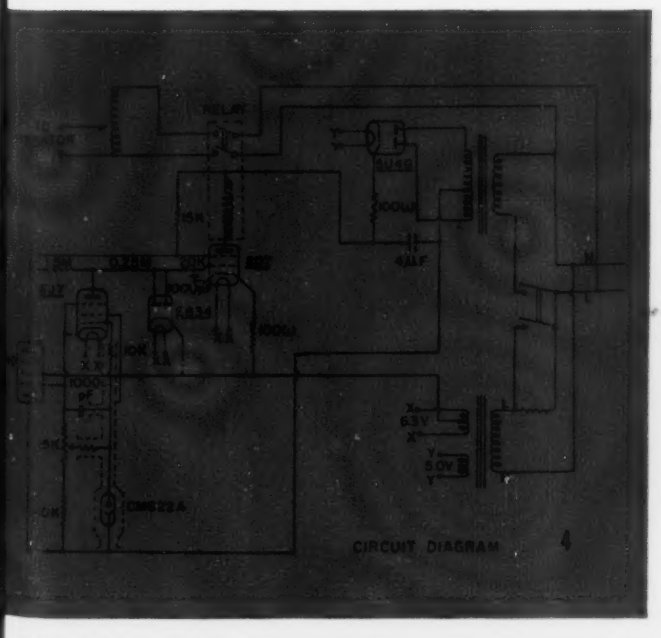
Facilitate British Foundry Operations

When a company is a manufacturer of electrical equipment it is natural that it should develop electrical devices for use in its foundry operations. This article describes units employed by Ferranti Ltd. of Great Britain for automatically adding inoculant to cupola iron and for measuring the moisture content of its molding sand

By VINCENT DELPORT
European Manager
FOUNDRY

WHEN a firm has been founded by a man of outstanding inventiveness and ability, one whose personality has infused those who have worked with him with his enthusiasm and his striving for progress, a tradition becomes established which ensures the constancy of a high standard.

Such is the case for the firm of Ferranti Ltd., of Hollinwood, in Lancashire, one of the main industrial centers of Great Britain. This concern is widely known for its production of electrical equipment and, ever since the original company of Ferranti, Thompson & Ince Ltd. was formed in 1882, it has been responsible for many notable developments, not only in the electrical field, but also beyond it. At Hollinwood the company operates a large, modern foundry in which special devices, designed and made by the company, denote the persistence of the spirit of inventiveness which was one of the main attributes of the founder of the firm.



The firm was founded by Sabastian Ziani de Ferranti, who was born in Liverpool in 1864 and died in 1930. At the age of 17, when he had started his career with the Siemens works, he had so impressed his employers that he was sent to superintend the installation of electric lighting plant, then almost in its infancy, in various parts of England. About that time he discovered the principle of creating a magnetic field around the first crucible electric furnace developed by Sir William Siemens, thus causing the molten metal to rotate and affording a more efficient mixing of the steel bath. Seven years later he applied this principle to the mercury type of electric meter, which became one of his firm's best known products.

Ferranti was a pioneer in the development of large electric power stations and, when only 21 years of age, he was responsible for the planning, building and equipping of the first power station at Deptford, in the suburbs of London, to supply the great city with electric current. He invented the Ferranti mains, a system of conductors made of concentric copper tubes, insulated with wax paper, which carried the current at 10,000 volts, a sensational pressure at the time, from Deptford to London for over 30 years. During the nineties and apart from its activities in Great Britain, the firm of Ferranti, Thompson & Ince, Ltd. equipped electrical stations in France, Spain and the Buenos Aires power station, with alternators of Ferranti's design.

The firm was reorganized in 1905, and its present chairman and managing director is Sir Vincent Z. de Ferranti, the son of the founder. In 1897 a factory was secured at Hollinwood and it has expanded ever since; from 700 workers employed in 1897 the firm now employs many thousands, both at Hollinwood and at other works at nearby Moston, and at Edinburg. The company also operates a factory at Brooklyn, and one at Toronto. Its principal activities include certain standard lines: Meters, transformers, instruments, radio and television and domestic ap-

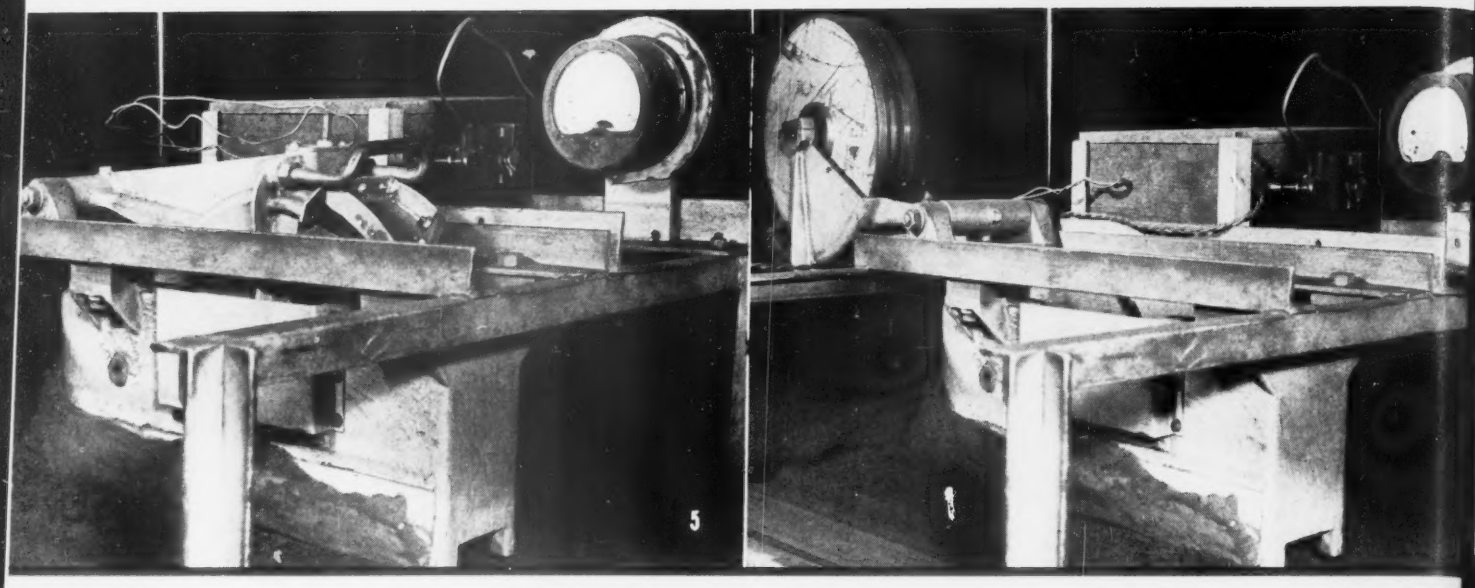


Fig. 5—Instrument used to make continuous reading of molding sand moisture content. Operating principle is based on the electrical resistance of the sand. Resistance is indicated on ammeter as a roller, equipped with copper rings, rotates on sand carried by belt conveyor. Carbon brushes make contact with the rings. In Fig. 6, the roller, at the far left, is shown in the off position

Fig. 7—Larger molds are rammed with sandslinger

pliances. More recently, it has also become prominent in the field of electronics, with the development of such devices as the digital computor.

The iron foundry operated by Ferranti Ltd. at Hollinwood was originally intended to make castings for the firm's use. It grew in step with the firm's expansion and is now also producing for outside users. The foundry, under the managament of R. Laroux Handley, who was president of the Lancashire branch of the Institute of British Foundrymen, operates at a melting rate of 125 tons per week. Its production covers a wide range, from small parts for electrical equipment, made on a production basis with an extreme accuracy of dimensions down to 0.005-in., to large individual castings up to 5 tons in weight, with an intermediate range of castings requiring molds up to 44 x 72 in. The firm is reputed for the high standard of finish of its castings.

In view of the specialized production of the firm in the field of electrical plant and equipment, a large proportion of the required parts must be nonmagnetic. With this end in view the company has evolved a nonmagnetic austenitic iron known as Nomag. The melting department consists of four cupolas lined to 24 in., and two of 36 in. diameter. The foundry is highly mechanized, and the section where the lighter type of castings is made comprises two complete mechanized molding and casting plants, where the pouring crew fill the molds standing on the conveyor (Fig. 8). Sand preparation and distribution is also designed on the most modern lines. For the heavy and individual castings, use is made of a mobile power-operated sandslinger, forming a separate station with its own sand handling plant. The modern core shop is equipped with molding machines and coreblowers. The largest cores made reach 3 tons in weight.

It is not the purpose of this article to give a full description of the foundry, but it is proposed to describe certain ingenious devices designed and made by the firm. The iron required for electrical parts is obtained in the cupola and additions are made in the ladle. These additions are made by means of an electronic method.

This electronic method is being applied at present to the bank of 24-in. cupolas supplying iron to the two mechanized sections making light castings. Some of the castings involved include sections as thin as 0.1-in. which must be machinable as cast. The cupolas are tapped at short intervals, each tap supplying between two and six 35-lb capacity hand-ladles and sometimes one or two 1-cwt capacity shanks. The present practice is to make an addition of approximately 0.2 per cent silicon in the form of crushed 75 per cent ferrosilicon, as a graphitizer. Previously this addition was made by hand by means of small scoops having the required capacity. The disadvantages of this system are only too obvious. Any haste or forgetfulness on the part of the caster would involve omission of the ferrosilicon and the castings would be scrapped.

To eliminate this risk the present electronic automatic addition method was evolved. Briefly the system involves a "telescope" containing a photo-electric cell, sighted on the tapping hole. Whenever metal passes within the area covered by the "telescope," radiation from the metal is detected by the photo-electric cell, the current from which is amplified by a relatively simple electronic circuit (Fig. 2).

The actual addition mechanism consists of a small hopper (Fig. 3) containing the ferroalloy, suspended over a trough tilted so that its end is over the cupola spout. Behind the trough is an electromagnetic

vibrator, which operates somewhere in the region of 80-120 volts, 50 cycle ac. This voltage is adjusted by means of a variable transformer. The circuit comprising the variable transformer and vibrator includes an electrical relay (Fig. 1) which is actuated by the amplified photocell current. As soon as metal flows, the vibrator immediately commences to shake the ferroalloy into the metal stream.

The only error in this system is due to the fact that the rate of flow of metal from the cupola, which is blown continuously for about 8½ hours, is not constant. However, it has been proved that the error so incurred is considerably less than the error present in the original system caused by the addition of a constant weight of ferroalloy to a ladle holding varying amounts of metal.

The rate of flow of ferroalloy can be adjusted over a wide range. Within limits, the voltage on the vibrator can be varied by means of the variable transformer which makes noticeable alterations to the amounts of ferroalloy added. In addition, the mechanical arrangement of hopper and trough can be adjusted to give varying gaps between the bottom of the hopper and the trough, which gives even greater variations in rate of flow.

The photo cell is mounted in a "telescope," which consists simply of a 2-in. tube about 18-in. long, having a plain glass at the front to exclude dirt. The telescope limits the area viewed by the cell and excludes extraneous light. This arrangement, combined with the fact that the sensitivity of the amplifying circuit can be adjusted, prevents any chance of the

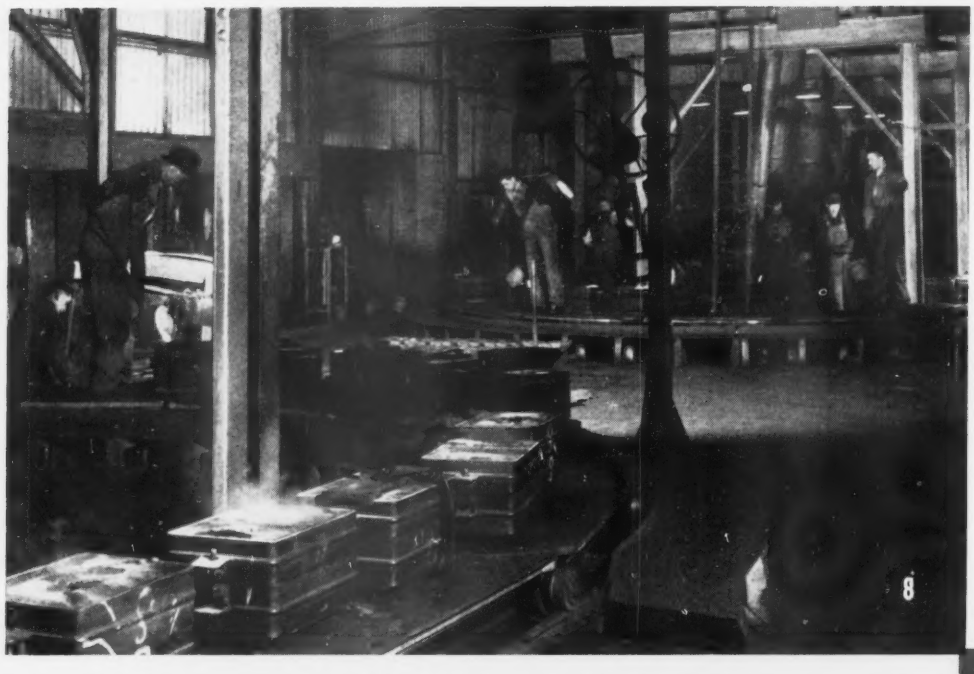


Fig. 8—Mechanized molding and pouring facilities are employed for the production of lighter types of castings

Fig. 9—A spring device for clamping smaller flasks also incorporates mold weight

Fig. 10 — This type electric truck is used to transport ladles up to 5-ton capacity

vibrator being actuated by a source other than hot metal flowing from the cupola. Various devices are incorporated to safeguard the mechanism from the rigorous foundry conditions to which it is subjected. These include a method whereby the valve heaters are always run at a reduced voltage when the furnaces are not in use. This is accomplished by leaving the main supply switch permanently "on," allowing current to leak through to the filament transformer via a resistance. Normal day-to-day switching is effected by a double pole manual switch which shorts out this resistance, bringing up the filaments to working temperature and at the same time energizes the high-voltage system. The absence of repeated switching on and off considerably improves the valve life.

As regards technical details of the amplifier, a 6J7 valve amplifies the output of the GMG22A gas-

filled photo-cell to a level sufficient to control the 807 output valve.

A single Stabilovolt valve STV280/40 stabilizes the anode, screen and grid bias voltages, utilizing rectified high-voltage supply. The circuit also includes a 5U4 rectifier valve without reservoir condenser to prevent any damage in the instant between the energizing of the high-voltage supply and the attainment of full cathode temperature.

The telescope must be sighted so that pourers or furnacemen do not interpose between it and the source of radiation, i.e. the metal, which would of course cause the operation to cease. This is easily done by attaching the telescope to any convenient structure available about 8 ft above floor level and about 6 ft from the tapping hole. It is preferable to sight the telescope on the actual tapping hole rather than on the spout, because odd pools of metal remaining in the latter after botting up may cause an overshoot of the ferroalloy alloy dropping onto the spout after the metal has ceased to flow.

One further point that should be mentioned is that the crushed ferroalloy is preferably obtained graded between two sieves. Oversize lumps will cause jamming in the vibrating trough, and the presence of dust causes inconvenience because it tends to rise in the hot air from the flowing metal, causing discomfort to workers in the immediate vicinity.

The accompanying diagram (Fig. 4) shows the electrical circuit employed.

Another interesting device is a continuous moisture tester for molding sand. This instrument at present is in use on a continuous line molding light gray iron castings and using naturally bonded molding sand.

The principle of operation is to use the electrical resistance of the sand as a measure of its moisture content. The resistance of molding sand depends primarily on the moisture content and seacoal content, as well as such other factors as grain size and density of specimen. By ensuring that the specimen of sand being measured is rammed to a constant density and the seacoal is kept relatively constant, the resistance can be used as a measure of the moisture content. The apparatus (Figs. 5-6) consists essentially of a relatively large roller rotating freely on the sand as it travels along the belt supplying the molding machines. On this roller are two insulated copper rings with carbon brushes making contact with them. The sand between these copper rings is a resistance in a simple electrical circuit including a milli-ammeter. The milli-ammeter is standardized against one of the normal methods of moisture testing and the scale graduated in percentage moisture. The reading on the ammeter not only gives a measure of the moisture content, but also the swing of the needle indicates the degree of homogeneity of the sand coming from the mill. A conveniently placed tap ensures that the operator can control the rate of flow of water to the mill, while observing the instrument.

Another interesting plant feature is the method of closing flasks with a spring device that clamps the flasks and embodies the weight instead of the usual loose weight (Fig. 9).

Molten metal handling for the jobbing part of the foundry is by ladles up to 5 tons capacity carried in special electric trucks traveling at a speed of 6 miles per hour. For pouring the ladles are picked up by a 10-ton crane. Pouring at the two continuous casting stations is done with 40-lb hand ladles.

Fig. 11—View of one section of the coreroom

Investments for the PRECISION CASTING PROCESS

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This study of the feasibility of using less critical materials for investments in precision casting work indicates that low-price foundry sands can be used as the refractory. Satisfactory results were obtained employing such binders as phosphate salts, plaster, and alumina base cement

ADVANTAGE offered by the precision casting process in being able to produce a large number of small parts to close dimensions, and to cast heat-resistant type alloys and other difficult-to-machine alloys at relatively high production rates, will probably, in a national emergency, lead to a greater utilization of this process than in the past. The higher production rates needed by the industry to produce the required castings will magnify any shortages of raw materials that were visible in the past.

During World War II there was a grave shortage of investment material. This shortage was not foreseen until the supplies of investment materials were seriously depleted. Hastily a great amount of work was done to develop a substitute investment. The report, "A Precision Casting Investment Produced by Application of the Hydrometer and Cumulative Curve Methods" by Robert E. Morey, published in June, 1946 by the Naval Research Laboratory, represents one of the outstanding pieces of work dealing with this critical shortage of investment material. The afore-

Heat-resistant alloy casting made in study of investments

TABLE II—Compositions of Investments Investigated

No.	Refractory Ratio: Lake	Albany	Juniata	Percent	Additions: Bentonite %	Tragacanth %	Alumina Cement %	Binders: Plaster %	Phosphate Salt Name %	MgO (fused, 300 mesh) %	Water CC
					SECTION A						
1	1 (80g)	1 (80g)	1 (80g)	95 (240g)	...	...	5 (12.6g)	...	...	...	73
2	1 (80g)	1 (80g)	1 (80g)	92.5 (240g)	...	...	7.5 (19.5g)	...	...	...	77
3	1 (80g)	1 (80g)	1 (80g)	90 (240g)	...	...	10 (26.7g)	...	...	...	81
4	1 (80g)	1 (80g)	1 (80g)	87.5 (240g)	...	...	12.5 (34.3g)	...	...	...	85
5	1 (80g)	1 (80g)	1 (80g)	85 (240g)	...	...	15 (42.3g)	...	...	...	89
6	1 (80g)	1 (80g)	1 (80g)	82.5 (240g)	...	...	17.5 (50.7g)	...	...	...	93
7	1 (80g)	1 (80g)	1 (80g)	80 (240g)	...	...	20 (60g)	...	...	...	97
8	1 (60g)	1 (60g)	2 (120g)	95 (240g)	...	...	5 (12.6g)	...	...	...	78
9	1 (60g)	1 (60g)	2 (120g)	92.5 (240g)	...	...	7.5 (19.5g)	...	...	...	82
10	1 (60g)	1 (60g)	2 (120g)	90 (240g)	...	...	10 (26.7g)	...	...	...	85
11	1 (60g)	1 (60g)	2 (120g)	87.5 (240g)	...	...	12.5 (34.3g)	...	...	...	89
12	1 (60g)	1 (60g)	2 (120g)	85 (240g)	...	...	15 (42.3g)	...	...	...	92
13	1 (60g)	1 (60g)	2 (120g)	82.5 (240g)	...	...	17.5 (50.7g)	...	...	...	96
14	1 (60g)	1 (60g)	2 (120g)	80 (240g)	...	...	20 (60g)	...	...	...	100
15	Ransom and Randolph IC-711-G1			Commercial investments used as comparison standards							
16	Kerr Ferrolite										
17	1 (60g)	1 (60g)	2 (120g)	94.5 (240g)	...	0.5 (1.26g)	5 (12.6g)	...	...	...	118
18	1 (60g)	1 (60g)	2 (120g)	89.5 (240g)	...	0.5 (1.33g)	10 (26.7g)	...	...	...	130
19	1 (60g)	1 (60g)	2 (120g)	84.5 (240g)	...	0.5 (1.41g)	15 (42.3g)	...	...	...	140
20	1 (60g)	1 (60g)	2 (120g)	79.5 (240g)	...	0.5 (1.5g)	20 (60g)	...	...	...	150

mentioned report was concerned only with the development of a refractory with a suitable particle size and distribution.

The authors foresee a possible shortage of investment binder as well. Commercial investments commonly used today contain one of two types of binder—ethyl silicate, or phosphates either as the acid or salt. In connection with the ethyl silicate binder it is necessary to use large amounts of alcohol as the vehicle for the refractory. As is well known, alcohol is critically needed in all parts of the war-making machinery. The other binder material, phosphoric acid, is also a critically needed war material. Both materials could be better used elsewhere than in the precision casting process should another emergency arise, providing suitable less critical substitutes could be developed.

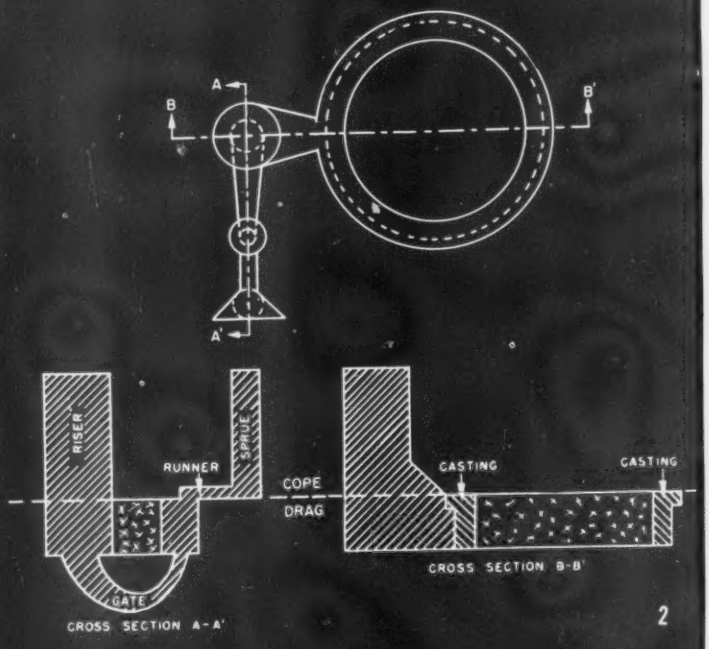
Experience has shown that one of the magnesium ammonium phosphate binder investments sold (*Please turn to page* 192)

TABLE I—Sand Analysis

U.S. Series Sieves	Sand Lake	Albany	Juanita
On 20	...	...	...
−20+30	0.3	0.1	...
−30+40	5.0	0.6	0.1
−40+50	49.4	2.9	2.5
−50+70	36.0	10.6	5.7
−70+100	8.9	39.2	21.8
−100+140	0.5	18.1	13.8
−140+200	0.1	19.7	20.9
−200+270	...	5.5	19.0
−270+325	...	1.5	3.8
−325	...	1.8	12.4

No.	Refractory Ratio Lake	Albany	Juniata	Percent	Additions Bentonite %	Tragacanth %	Alumina Cement %	Plaster %	Binders Phosphate Salt Name %	MgO (fused, 300 mesh) %	Water CC
					SECTION B						
21	1 (60g)	1 (60g)	2 (120g)	97.5 (240g)	...	...	...	...	...	2.5 (6.15g)	80
22	1 (60g)	1 (60g)	2 (120g)	95 (240g)	...	...	...	...	...	5 (12.6g)	93
23	1	1	2	91.2	...	...	...	...	Ammonium Phosphate Primary 6.5 (17.1g)	2.3 (6g)	89
24	1 (60g)	1 (60g)	2 (120g)	83.8 (240g)	...	...	...	...	12 (34.2g)	4.2 (12g)	114
25	1 (60g)	1 (60g)	2 (120g)	90.3 (240g)	...	...	...	...	Ammonium Phosphate Secondary 7.4 (19.7g)	2.3 (6g)	85
26	1 (60g)	1 (60g)	2 (120g)	82.4 (240g)	...	...	...	...	13.5 (39.3g)	4.1 (12g)	100
27	1 (60g)	1 (60g)	2 (120g)	90.6 (240g)	...	...	...	...	Calcium Phosphate Primary 7.1 (18.8g)	2.3 (6g)	135
28	1 (60g)	1 (60g)	2 (120g)	82.9 (240g)	...	...	...	...	13.0 (37.5g)	4.1 (12g)	150
29	1 (60g)	1 (60g)	2 (120g)	92.8 (240g)	...	...	...	...	Calcium Phosphate Secondary 4.9 (12.8g)	2.3 (6g)	100
30	1 (60g)	1 (60g)	2 (120g)	86.5 (240g)	...	...	...	...	9.2 (25.6g)	4.3 (12g)	115
31	1 (60g)	1 (60g)	2 (120g)	89.2 (240g)	...	...	...	...	Tertiary 8.6 (23.1g)	2.2 (6g)	100
32	1 (60g)	1 (60g)	2 (120g)	80.5 (240g)	...	...	...	...	15.3 (46.2g)	4.2 (12g)	145
33	1 (30g)	1 (30g)	1 (30g)	92.3 (90g)	...	...	...	...	Ammonium Phosphate Primary 5.1 (5g)	2.6 (2.5g)	33
34	1 (30g)	1 (30g)	1 (30g)	90.5 (90g)	...	...	...	...	7.0 (7g)	2.5 (2.5g)	33
35	1 (30g)	1 (30g)	1 (30g)	87.9 (90g)	...	...	4.8 (5g)	...	6.7 (7g)	2.3 (2.5g)	33
36	1 (30g)	1 (30g)	1 (30g)	88.2 (90g)	...	...	4.9 (5g)	...	6.9 (7g)	...	31
					SECTION C						
37	1 (66g)	1 (66g)	1 (66g)	92.9 (198g)	1.9 (4g)	...	...	5.2 (11g)	...	...	70
38	1 (66g)	1 (66g)	1 (66g)	87.8 (198g)	1.8 (4g)	...	...	10.4 (23.4g)	...	...	78
39	1 (66g)	1 (66g)	1 (66g)	82.8 (198g)	1.7 (4g)	...	...	15.5 (37g)	...	...	86
40	1 (66g)	1 (66g)	1 (66g)	77.8 (198g)	1.6 (4g)	...	...	20.6 (52.5g)	...	...	94
41	1 (66g)	1 (66g)	1 (66g)	72.8 (198g)	1.5 (4g)	...	...	25.7 (70g)	...	...	102
42	1 (453g)	1 (453g)	1 (453g)	98 (1359g)	2 (27.8g)	...	..	...	...	...	445
43	1 (340g)	1 (340g)	2 (680g)	98 (1360g)	2 (27.8g)	...	...	...	...	...	465
44	1 (453g)	1 (453g)	1 (453g)	93.1 (1359g)	1.9 (27.8g)	...	...	5 (73g)	. .	...	475
45	1 (453g)	1 (453g)	1 (453g)	88.2 (1359g)	1.8 (27.8g)	...	...	10 (154g)	...	...	510
46	1 (453g)	1 (453g)	1 (453g)	83.3 (1359g)	1.7 (27.8g)	...	...	15 (245g)	...	...	545
47	8 (1049g)	1 (144g)	1 (144g)	83 (1328g)	2.0 (32g)	...	5 (80g)	10 (160g)	...	...	480
48	1 (453g)	1 (453g)	1 (453g)	85.5 (1359g)	...	...	4.5 (72g)	10 (160g)	...	...	460
49	1 (1360g)	0	0	90.2 (1360g)	...	...	4.8 (72g)	5 (75g)	...	...	410
50	1 (1360g)	0	0	85.5 (1360g)	...	...	4.5 (72g)	10 (160g)	...	...	420
51	8 (1040g)	1 (130g)	1 (130g)	85 (1300g)	...	...	5 (76.5g)	10 (153g)	...	...	410
52	8 (1040g)	1 (130g)	1 (130g)	80 (1300g)	...	...	5 (81g)	15 (244g)	...	...	425
53	8 (1040g)	1 (130g)	1 (130g)	91 (1300g)	...	...	...	...	Ammonium Phosphate Primary 6.7 (95.2g)	2.3 (33.4g)	330
54	8 (1040g)	1 (130g)	1 (130g)	90.4 (1300g)	...	...	...	...	Calcium Phosphate Primary 7.3 (104.5g)	2.3 (33.4g)	340
55	8 (1040g)	1 (130g)	1 (130g)	93 (1300g)	...	...	...	5 (69.2g)	Calcium Phosphate Primary 1.5 (20.3g)	0.5 (6.5g)	350
56	8 (1040g)	1 (130g)	1 (130g)	88 (1300g)	...	...	5 (73.8g)	5 (73.8g)	Calcium Phosphate Primary 1.5 (22.1g)	0.5 (7.4g)	370

PRODUCTION OF
Aluminum-Nickel B
SAND CASTINGS



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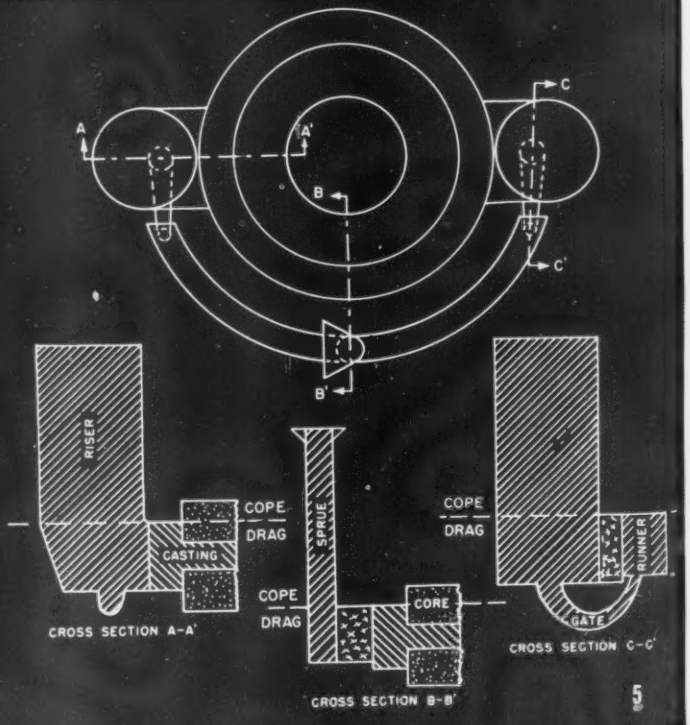


5

By VINCENT DePIERRE
and RICHARD C. WYNNE
Metallurgists
U. S. Naval Gun Factory
Washington

Bronze

Fig. 1—Sprue, gates, runners and risers for sand casting an aluminum-nickel bronze eccentric bushing. Fig. 2 shows detailed sketch of the bushing and the bushing after cleaning is shown in Fig. 3

Fig. 4—Sprue, gates, runners and risers for sand casting an aluminum-nickel bronze gear rim. A detailed sketch of the rim is shown in Fig. 5, and Fig. 6 is a view of the rim after it was cleaned

PRODUCTION variables affecting the quality of castings may be grouped under the following headings: 1. Melting conditions 2. Pouring conditions 3. Mold conditions. Melting conditions are under direct control of the foundry and can be standardized so that highest possible quality of molten alloy is produced consistently from melt to melt. Pouring and mold conditions necessary for producing sound castings are dictated by the design of the casting and the alloy specified for it. Therefore, these conditions may vary with each type of casting.

This article covers production practices employed at the U. S. Naval Gun Factory, Washington, for aluminum-nickel bronze sand castings. It also discusses properties of Naval Gun Factory aluminum-nickel bronze sand castings.

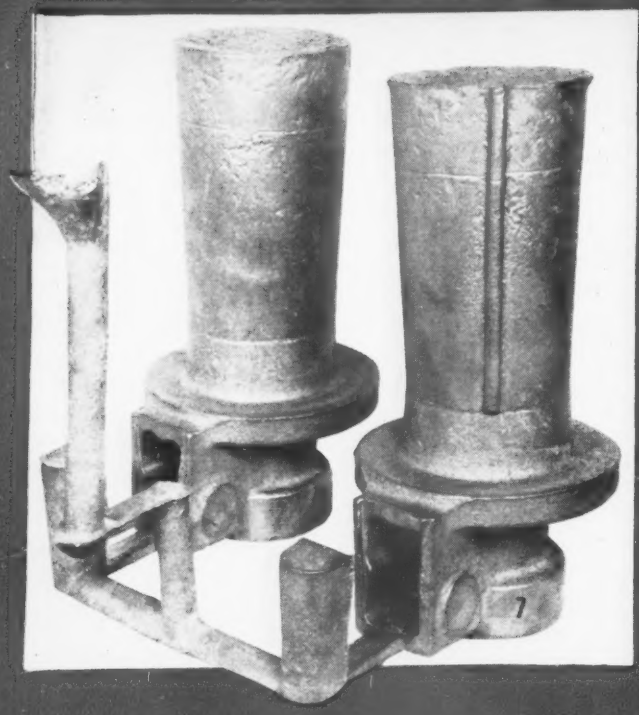
Melting Equipment—Twenty-four gas-fired crucible furnaces with push-back covers are used in the U. S. Naval Gun Factory for melting nonferrous metals and alloys for sand castings. Twelve of the furnaces hold No. 150 crucibles; the other twelve hold No. 275 crucibles. The furnaces originally had silicon carbide brick linings backed with insulating fire bricks. The average life of these linings was about 500 bronze melts. At present the furnaces have mullite-base rammed linings which also have an average life of about 500 bronze melts.

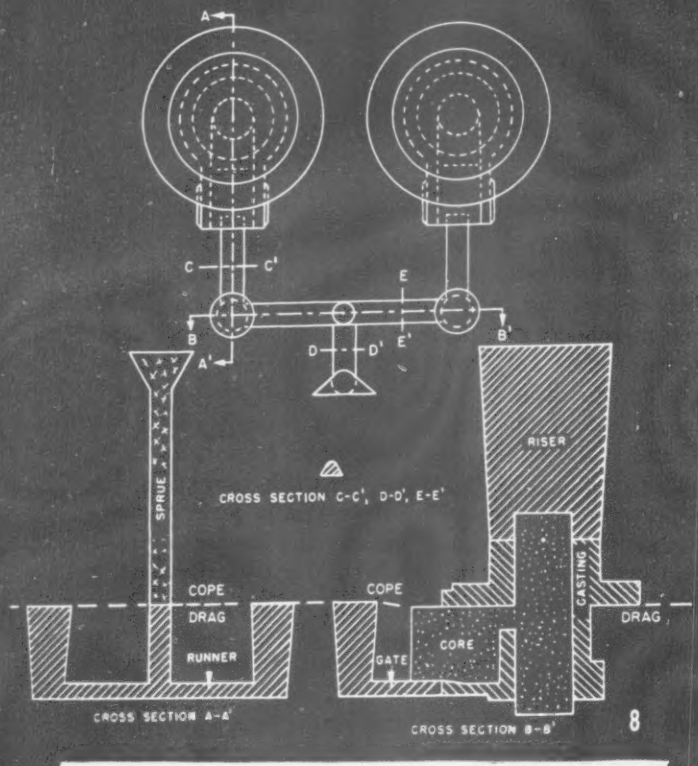
Furnace covers are made of silicon carbide refractory held in a steel ring. The average life of the cover refractory is approximately 400 bronze melts. An 8-in. diam hole in the center of the cover allows combustion products to escape from the furnace and facilitates making additions to, and stirring the molten metal, in the furnace. A mechanical steel device attached to the cover and furnace body enables the melter to open or close the furnace by pushing the cover back from the furnace top to open the furnace, and pulling the cover forward to close it.

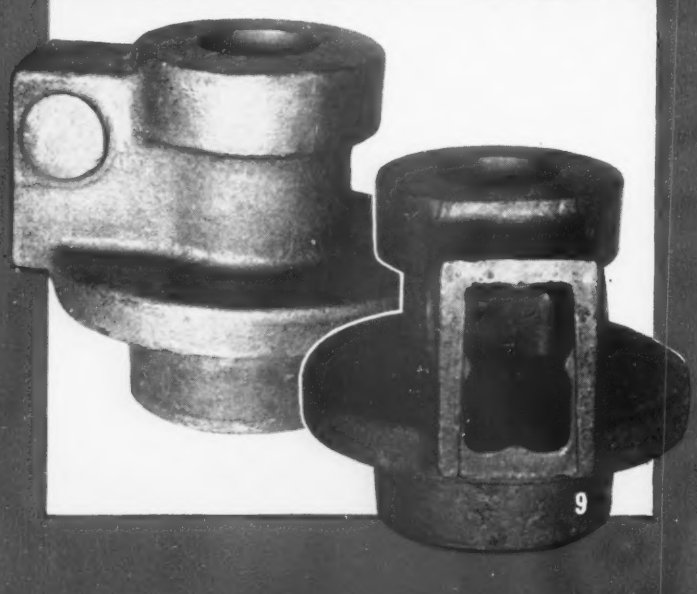
Each furnace is equipped with two gas burners and a proportional mixer which automatically proportions and mixes the gas and air entering the burners. Air-gas adjustments may be made to furnish reducing, neutral or oxidizing furnace atmospheres. After the air-gas adjustment has been set, all regulations of quantity of flame are assured by variations of the air supply through adjusting the air valve to the size flame desired. The proportional mixer keeps the furnace atmosphere constant. For bronze melting a slightly oxidizing flame is used in the furnaces.

One blower for every three furnaces is used to supply air. Gas is obtained from gas lines of the Washington Gas Light Co., Washington. Approximately 9 cu ft of 1100 Btu gas are consumed per pound of bronze melted. Heating the gas-fired furnaces from room temperature to operating temperature requires about 20 minutes.

Both silicon carbide and graphite crucibles are used for melting nonferrous metals and alloys. The sizes generally employed are crucible Nos. 150 and 275 with 450 and 725 lb capacity, respectively, of molten bronze. Average life of the crucibles in the gas-fired furnaces has been 20 bronze melts for the graphite type and 50 bronze melts for the silicon carbide type. The crucibles rest in the furnaces on solid stools







which are 10 in. diam and 4 in. high for the No. 275 crucible and 6 in. in diam, 4 in. high for the No. 150 crucible. Stools are made of silicon carbide refractory material and have an average life of about 100 bronze melts.

Raw Materials for Melting—New metals and scrap are the raw materials used for making aluminum-nickel bronze alloy for sand castings. The new metals are high-purity ingredients purchased under government specifications. The following new metals are used for aluminum-nickel bronze melts:

1. Copper ingots, Grade A, Navy Department Specification 46C5.
2. Aluminum ingots, Grades 2 or 5, Navy Department Specification 46A2.
3. Nickel cathodes, Grade A, Federal Specification QQ-N-301.
4. Very low carbon iron in the form of horseshoe nail clippings.

Typical analyses of new metals used are listed in Table I. The scrap is composed of carefully segregated heads, gates, risers and obsolete or defective castings. The scrap is clean, oil-free, corrosion-free and of known composition.

Melting Procedures—The melting procedures for aluminum nickel bronzes is done under a slightly oxidizing furnace atmosphere. No cover, no charcoal, no degassing procedures, no hardener, and no special deoxidizers are used in the melting. Melts of 300 pounds and 600 pounds are usually made.

The Naval Gun Factory has used charcoal cover on aluminum-nickel bronze melts and found that unless the charcoal is absolutely dry and free of volatile components gassy melts may result. No practical advantage or improvement in melt quality has been found in the use of covering fluxes or charcoal on aluminum-nickel bronze melts. Three melting procedures used at the U. S. Naval Gun Factory for aluminum-nickel bronze are: Procedure 1—Melting New Metals. Procedure 2—Melting New Metals Plus Scrap. Procedure 3—Melting Scrap.

The following steps are followed in Melting Procedure 1 for new metals:

1. Iron horseshoe nail clippings, nickel cathodes cut into approximately 1-in. square and 75 per cent of the Cu are charged into the crucible, melted and stirred.
2. The remaining copper then is added and melted.
3. Aluminum pigs cut into approximately 2-in. cubes then are added and stirred into the melt.
4. Three oz of cryolite per 100 lb of melt are added to the melt surface to dissolve the oxides about 10 minutes before pouring.
5. The melt is heated to pouring temperature and poured.

Melting Procedure 2 is used for melting new metals and scrap (50 per cent new metals and 50 per cent scrap) and is conducted as follows:

1. Same as in Procedure 1 except that all the cop-

Fig. 7—Sprue, gates, runners and risers for sand casting an aluminum-nickel bronze buffer case. A detailed skech is shown in Fig. 8, while Fig. 9 is a view of the buffer cases following cleaning

Table I—Typical Analyses of New Metals

	Copper 46C5 Grade A	Aluminum 46A2 Grade 2	Aluminum 46A2 Grade 5	Low Carbon Iron	Nickel Cathode Grade A QQ-N-301
Cu	99.98	0.02	<0.02	0.07	....
Ni	None	....	....	None	99.53
Al	....	99.28	99.86	....	....
Fe	0.0014	0.51	0.10	Remainder	0.03
Si	....	0.09	0.03	0.01	....
Ag	0.0054	....	....	....	....
Zn	None	0.02	<0.02	....	....
Pb	0.0011	....	....	....	....
Mn	....	<0.02	<0.02	0.22	....
Mg	....	0.02	<0.02	....	....
Ti	....	None	None	....	....
Cr	....	....	....	None	....
C	....	....	....	0.05	0.03
S	....	....	....	0.037	0.008
P	....	....	....	0.010	....
Sn	None	....	....	....	....
Co	....	....	....	....	0.40

Table II—Data on Casting Yield

	Weight— As Cast, lb	Cleaned, lb	Yield, Per cent
Eccentric bushing (Figs. 1 and 2) ...	41.5	16	38.5
Gear rim (Figs. 4 and 6)	182.5	62	33.9
Buffer cases (Figs. 7 and 9)	222	84.8	38.1

Table III—Composition and Properties

Chemical Composition

	Per cent	
Cu	78	(min)
Al	7-12	
Fe	2.5-4.5	
Mn	3.5	(max)
Ni	5.0	(max)
Sn	0.50	(max)
Total other elements	0.50	(max)

Physical Properties

Tensile strength	90,000 psi (min)
Yield strength, (.005 in. per in. extension under load)	45,000 psi (min)
Elongation in 2 in.	6% (min)

per is charged into the crucible in the first step.

2. Scrap is then added and melted.

3. 4. and 5.—The same as steps 3, 4, and 5 of Procedure 1.

Melting Procedure 3 for melting 100 per cent scrap melts is conducted as follows:

1. Scrap is charged into the crucible and melted.

2. and 3. Same as steps 4 and 5 of Procedure 1.

The approximate melting times for the various procedures starting with a cold furnace are:

	No. 1	No. 2	No. 3
300-lb melt	2 hr	1¾ hr	1⅝ hr
600-lb melt	3 hr	2¾ hr	2½ hr

Temperature Control—Chromel immersion thermocouples attached to indicating pyrometers located near the furnaces are used for temperature control of bronze melts. Temperature of the molten bronze is measured at frequent intervals and maintained below pouring temperature by decreasing fuel supply or by adding raw materials to cool the melt. This procedure minimizes the formation of oxides on aluminum-nickel bronze melts and, together with the oxidizing furnace atmosphere, practically eliminates gas troubles in aluminum-nickel bronze melts.

Pouring Practices — Aluminum-nickel bronze melts are poured directly from the melting crucibles into the sand molds. The pouring temperatures are:

2000°F for heavy castings (1 in. and over)

2100°F for medium castings (½ to 1 in.)

2200-2250°F for light castings (under ½-in.)

To minimize dross which readily forms on aluminum-nickel bronze melts the following precautions are taken in pouring this alloy: 1. The crucible lip

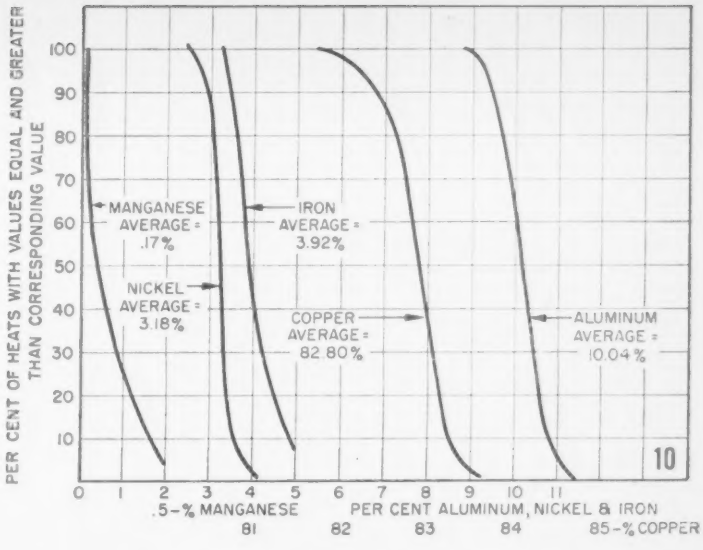

PER CENT OF HEATS WITH VALUES EQUAL AND GREATER THAN CORRESPONDING VALUE
MANGANESE AVERAGE = .17%
NICKEL AVERAGE = 3.18%
IRON AVERAGE = 3.92%
COPPER AVERAGE = 82.80%
ALUMINUM AVERAGE = 10.04%
.5-% MANGANESE
PER CENT ALUMINUM, NICKEL & IRON
85-% COPPER
10

Fig. 10—Chemical composition of 116 heats of aluminum bronze sand castings, Class D (F.S. QQ-B-671a), made in U. S. Naval Gun Factory. Tin and lead each under .02%. Requirements of this specification: Copper 78% min., aluminum 7-12%, iron 2.5-4.5%, manganese 3.5% max., nickel 5% max., tin .50% max., total of all other elements .50% max.

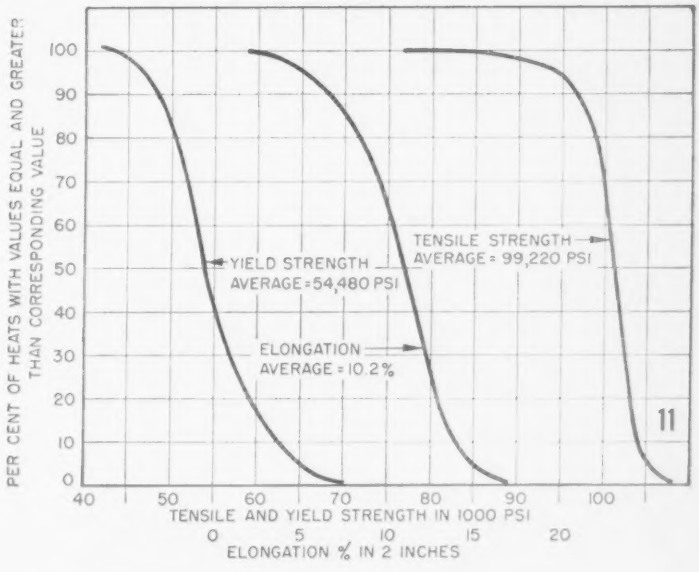
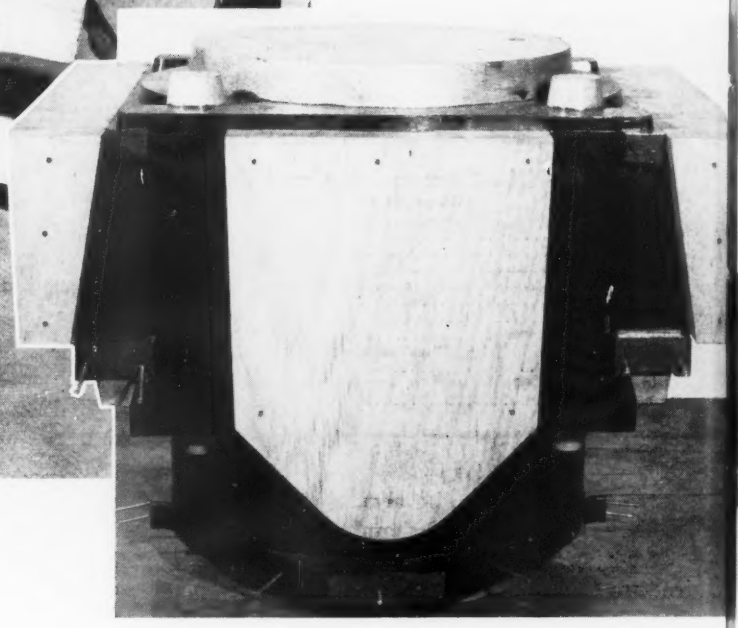

PER CENT OF HEATS WITH VALUES EQUAL AND GREATER THAN CORRESPONDING VALUE
YIELD STRENGTH AVERAGE=54,480 PSI
TENSILE STRENGTH AVERAGE = 99,220 PSI
ELONGATION AVERAGE = 10.2%
TENSILE AND YIELD STRENGTH IN 1000 PSI
ELONGATION % IN 2 INCHES
11

Fig. 11—Tensile strength, yield strength, elongation of the 116 heats. Minimum requirements: Tensile strength 90,000 psi, yield strength 45,000 psi, elongation 6%. Data from keel type sand cast bars

is held as close as possible to the sprue. 2. A steady stream is maintained during pouring. 3. A slow pouring rate is used at the start of pouring and increased slightly as the mold fills. Pouring rates are selected to keep the gates uniformly filled and to allow the molten alloy to flow quietly without agitation in the mold. This prevents dross from being drawn into the molds. Pouring rates vary not only during the pouring of a single casting but also with the size of casting and gating design.

Mold Materials—No. 1 Albany Sand, Class 8, Bureau of Ordnance Specifica- (*Please turn to page* 247)



Left — Mold ready to receive one of the combination cores located at each side. *Below*—Center part, main pattern body

Model Castings DEVELOPED

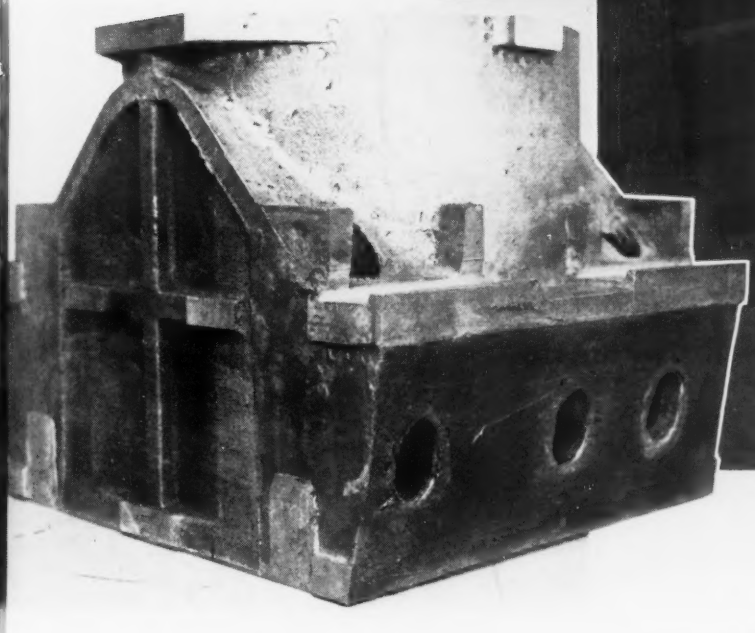
Casting showing position of sprue and risers

SEVERAL model castings for a section of the proposed world's largest press—to be used in fabricating large closed die forgings for jet airplane parts—have been made at the Alabama Polytechnic Institute, Auburn, Ala. The complicated pattern and core boxes were made in the Engineering Shops department with the assistance of local foundrymen and with Dan T. Jones, head professor of the Engineering Shops, serving as project director.

The aluminum model castings are of the main cylinder holding rings for the loading cylinders of the proposed 75,000-ton closed die forging press. The press was designed and will be built by the Lowey Construction Co. Inc., New York, under the supervision of and for the Air Materiel Command.

In the March, 1952 issue of *The Boilermaker's Journal* it is stated that Germany was ten or more years ahead of the United States in making large light alloy forgings and that recently Russia has stepped ahead in this field. The same article stated that a

Right — Pouring aluminum from large crucible down central sprue. *Below*—The completed casting shown opposite position in mold



FOR HUGE Forging Press

33,000-ton forging press, taken from Germany by the Russians, is now in operation somewhere in Russia. Also, that the Russians have been building a 55,000-ton press from drawings they found in Germany. During World War II U. S. technicians actually reached the 33,000-ton German forging press first, with orders to move it or blow it up. They could not move it on short notice and later it developed that the press was in the Russian zone. Subsequently the Russians moved it. The United States has claimed two 16,500-ton (metric) presses and several smaller ones. The largest press in the United States is an 18,000-ton forging press.

The United States has not been idle since World War II, but has been studying the possibility of constructing presses which could surpass anything designed or built in Germany. To this end the Lowey Construction Co. developed a design for super-presses which would make possible a large production capacity yet maintain high quality products.

In 1950 Dr. R. G. Sturm, then professor of engineering mechanics at Purdue University, was selected as consultant to investigate the design to conduct research to insure the stable and controlled operation of the press. Fellowships providing for Ph.D. theses were established at Purdue. One project dealt with the analysis of main cylinder holding rings. This project requires the manufacture of models of the particular casting, which is not only extremely large but also extremely complicated. These models are being studied by experimental stress analysis methods at Purdue.

Development of cores and coreboxes, patterns and techniques was undertaken by the Engineering Shops at the Alabama Polytechnic Institute. The project was brought to the institute through the Auburn Research Foundation. Up to this writing four castings have been made and shipped to Purdue. The final design of the press will be established after test results at Purdue and Alabama are available.

Fig. 2—Worker pushes mold-carrying straddle boards off end of pouring area conveyor track

Modernized Foundry

Boosts Castings Output

By ROBERT H. HERRMANN
Associate Editor
FOUNDRY

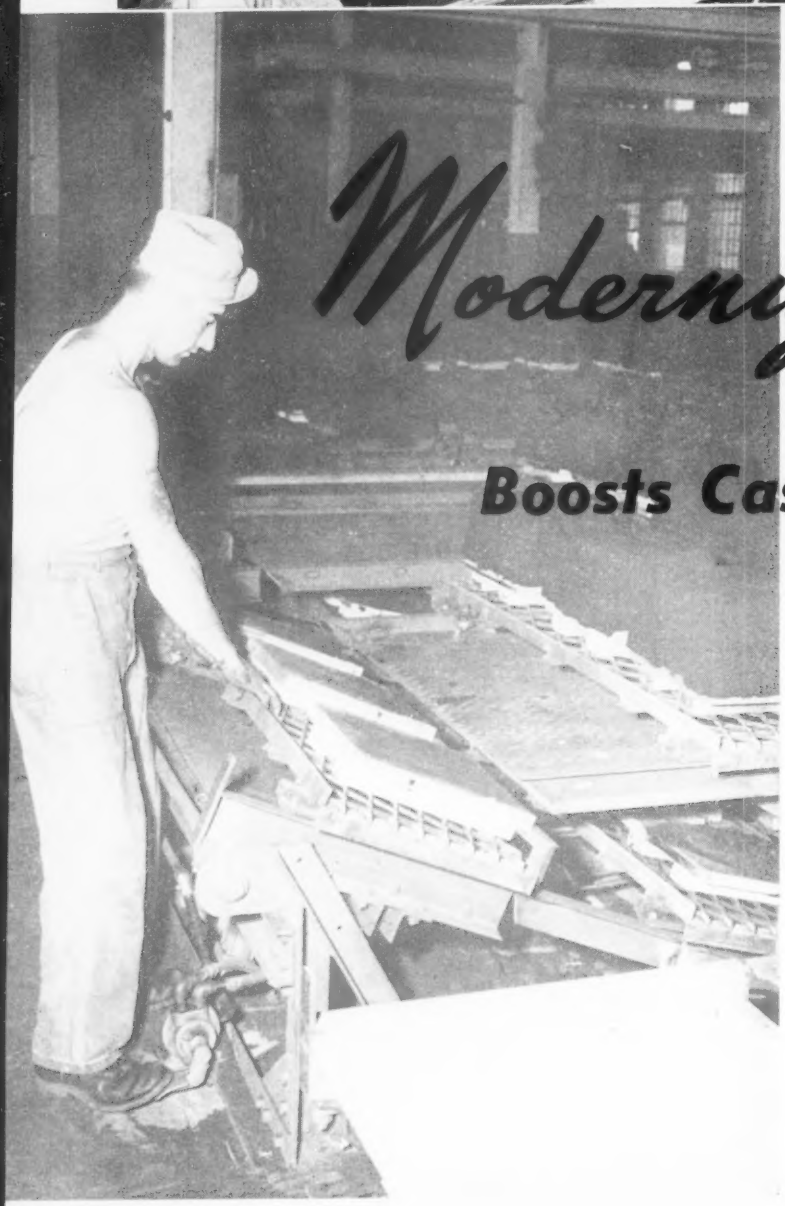


Fig. 1—Molder raises straddle board, carrying bottom boards, from the lower level return track

Fig. 3—Molds strike open a hinged door and drop to oscillating conveyor in enclosed pit

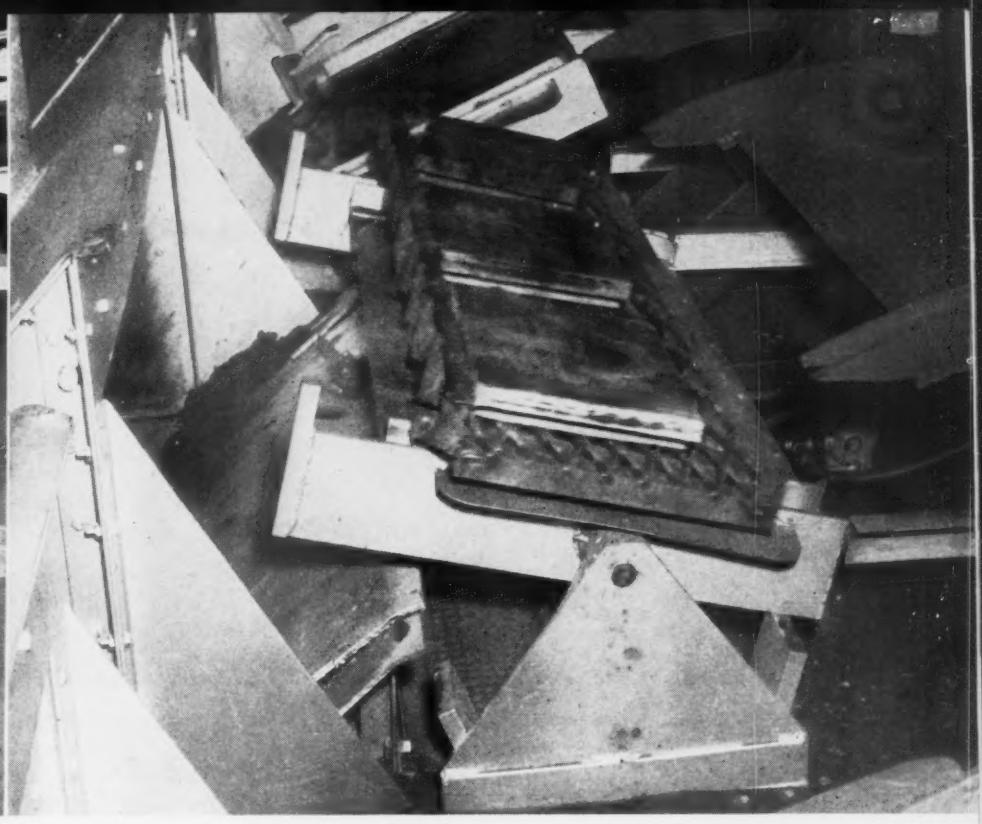


Fig. 4—Movable track section tilts to start straddle board on return trip to the molder

BY REBUILDING, redesigning and mechanizing a section of its foundry known as the east foundry system, Dodge Mfg. Corp., Mishawaka, Ind., manufacturer of power transmission machinery, has increased by 50 per cent production of smaller sized cast iron speed reducer casings, housings for sleeve bearings and pillow blocks, sheaves and sheave hubs and machinists' vises. The new mechanized unit has been in operation only a few months, and production is expected to increase considerably as operators become more familiar with the equipment and additional jobs are added to the system.

While basic plans for the mechanized system were being made, an opportunity presented itself when a foundry in Cleveland decided to close down a unit that had been constructed during the latter part of World War II. Little-used equipment was offered for sale including sand conditioning, electrical, material handling, and dust and smoke exhausting equipment. Dodge purchased everything that could be used in its new installation.

Part of the building housing the mechanized foundry had to be reconstructed to accommodate the equipment. Excavations had to be made for deep pits and the labyrinth in which conveyors and other underground equipment operates. Since the original building had been constructed over a creek running through the property, new excavations posed the problem of reinclosing the creek so that it would not interfere with equipment installation. The creek enclosure also serves as a drain for much of the water used in plant operations.

The new unit occupies a section of building about 75 ft wide and 180 ft long. Along one long side are located eight jolt-squeeze molding machines, handling slip flask work, and four jolt, pin lift and two rollover machines, handling tight flask work. These molding machines are serviced by overhead sand hoppers of 1½ tons capacity. Hoppers are fed by an overhead 24-in. conveyor belt, carrying sand from the mullers. Adjustable scrapers over each molding station provide a steady flow of prepared sand to each hopper.

Around each molding machine are floor grates through which strike-off sand falls to an underground, 20-in. belt conveyor, leading back to molding sand storage or to the overhead sand distribution belt, as desired. Any excess sand carried past molders' sand hoppers by the overhead distribution belt is discharged into a chute leading to the underground sand return belt. That chute incorporates a switching mechanism for depositing sand into a container for transportation to another foundry area if needed.

As molds are made on the jolt-squeeze machines, the slip flasks are removed and the molds placed with their bottom board on wheel-mounted straddle boards which ride on double rail tracks extending behind the molding machines. Tracks are mounted on a platform about 2 ft above floor level. The straddle boards, constructed of expanded metal grating welded to a rectangular angle iron framework are 5 ft long and 20 in. wide; they are equipped with four standard, ballbearing, roller skate, load-carrying wheels and four similar guide wheels. The rails in each set of tracks are U-shaped channels with the base of the U on the inside, against which the guide wheels roll. Three sets of these tracks are available to each two molders. One set of tracks is located directly behind

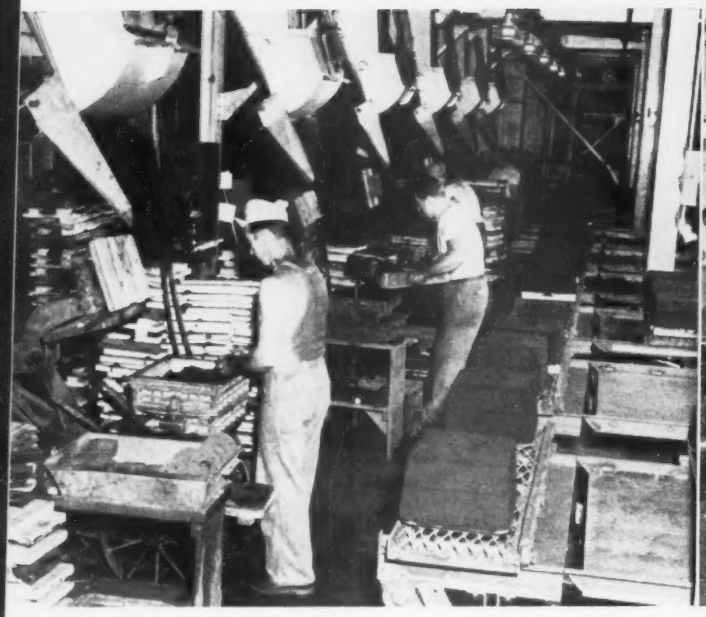


Fig. 5—Jolt-squeeze molding machines, serviced by overhead sand hoppers, handle slip flask work

Fig. 6—Jacketed molds, riding on straddle boards, are poured from ladles carried by traveling cranes

each molding machine and the other set is placed between these two. Tracks extend 45 ft from the molding area to the point where poured molds are discharged to an oscillating conveyor.

When a molder has loaded a straddle board with molds (usually three molds), he gives the carrier a push along the rails toward the pouring area. Then by stepping on a pedal he actuates a compressed-air-operated cylinder which pivots a short section of the track downward to line up with another track immediately beneath that which carries the loaded straddle boards. Straddle boards, carrying bottom boards, are returned from the mold discharge point to the molder on this lower track. When the movable section of track pivots downward and lines up with the lower track, the molder reaches down and rolls one of the straddle board carriers onto the movable track section.

Upon release of the foot pedal, the movable track is pushed back up in alignment with the upper track. At the same time, another air cylinder moves a length of cable 20 in. This cable is looped around two small-diameter wheels midway between the rails of the lower track. One is located under the movable track section just described and the other mounted about halfway down the length of fixed track. Lugs are fastened on this cable at 20-in. intervals. As the cable moves forward, the lugs engage each of the straddle boards on the track and pull them forward 20 in., the width of one board, placing the first one in line within easy reach of the molder when he needs it. As the cable moves back to its original position the lugs tilt in passing the straddle boards. Counterweights pivot the lugs back to pushing position again in the openings between the boards.

The 45-ft area between molding and discharge of poured molds constitutes the pouring and casting cooling area. Molds are jacketed and the pouring crew pours all castings from ladles suspended from bridge cranes. Molten metal is brought from the cupolas by a 3000-lb capacity bull ladle, propelled electrically on an overhead monorail. An operator in a control cab rides with the ladle. Path of travel of the metal carrier is at right angles to the mold carrying rails, just behind the line of molding machines. The operator stops the carrier in the area and lowers the transfer ladle for filling ladles of the pouring crew.

Because castings produced in this area vary greatly in size, shape and weight, they require different cooling times after the molds are poured. For this reason movement of molds from molding machines to discharge point is not mechanized.

After molds have been poured and the castings are cooled sufficiently, a worker with a long stick pushes the straddle boards with their load of molds off the discharge end of the rails. Straddle boards roll down a short incline onto a movable section of track and are stopped by two vertical metal arms equipped with rubber shock absorbers. The molds slide off their bottom boards, which are retained on the straddle boards by a raised edge at the forward end. As the molds slide off the bottom boards, they strike a door, hinged at the top, forcing it open. Sand and castings fall to a 90-ft long oscillating conveyor operating in an enclosed pit below floor level.

As the straddle boards roll onto the movable track section to spill the molds they strike a lever just before hitting the stops. This lever actuates a compressed-air-operated device, which, after sufficient delay to allow the molds to slide off the bottom boards, tilts the movable section of track back to alignment with the lower set of tracks on which straddle boards return to the molders. As the boards roll off the movable track section they strike another lever, controlling a compressed-air device to return the movable track section to its original position, ready to receive the next load of molds. On their return, the straddle boards travel by gravity along the tracks to the point where they are en-

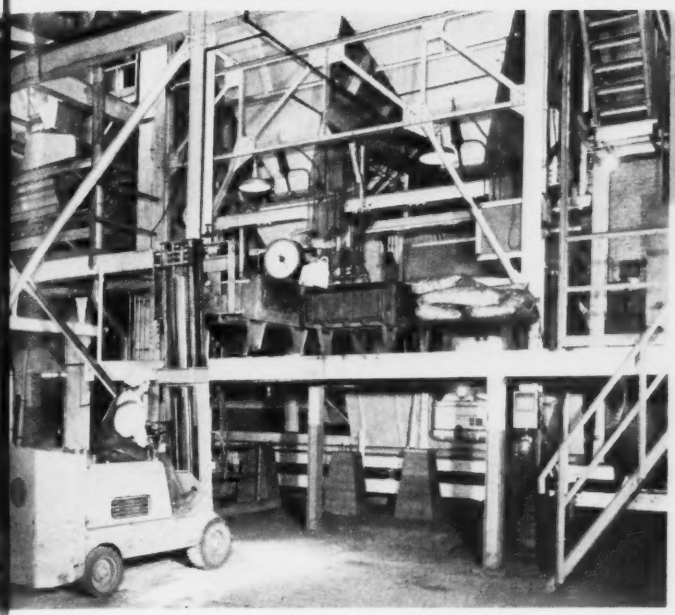


Fig. 7—Sand preparation center, showing overhead storage bins, traveling weigh lorry, and the muller

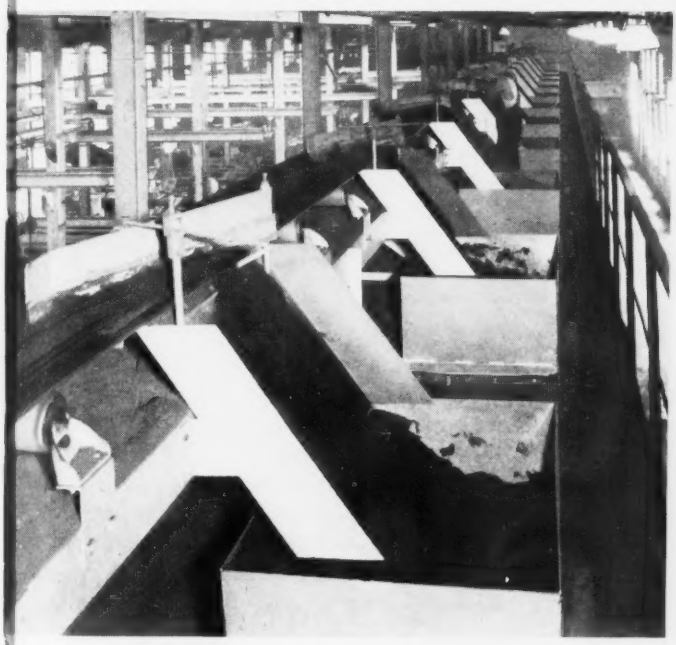


Fig. 8—Conditioned molding sand is plowed from conveyor belt into molding machine supply hoppers

gaged by the lugs on the cable, previously described, to be pulled up to the molder.

Molds made on the jolt, pin-lift and rollover molding machines are larger than those on the jolt-squeeze machines and are made in tight flasks. They are pushed manually on roller conveyors from molders, through pouring and cooling area, to a transfer car which rolls on rails at the end of the roller conveyors and at right angles to them. Transfer car is equipped with a section of roller conveyor which lines up with the pouring section conveyors to facilitate transfer of molds to the car.

The car holds four molds and is pushed manually along the track to a vibrating shakeout at the head end of the below-floor-level vibrating conveyor. Each

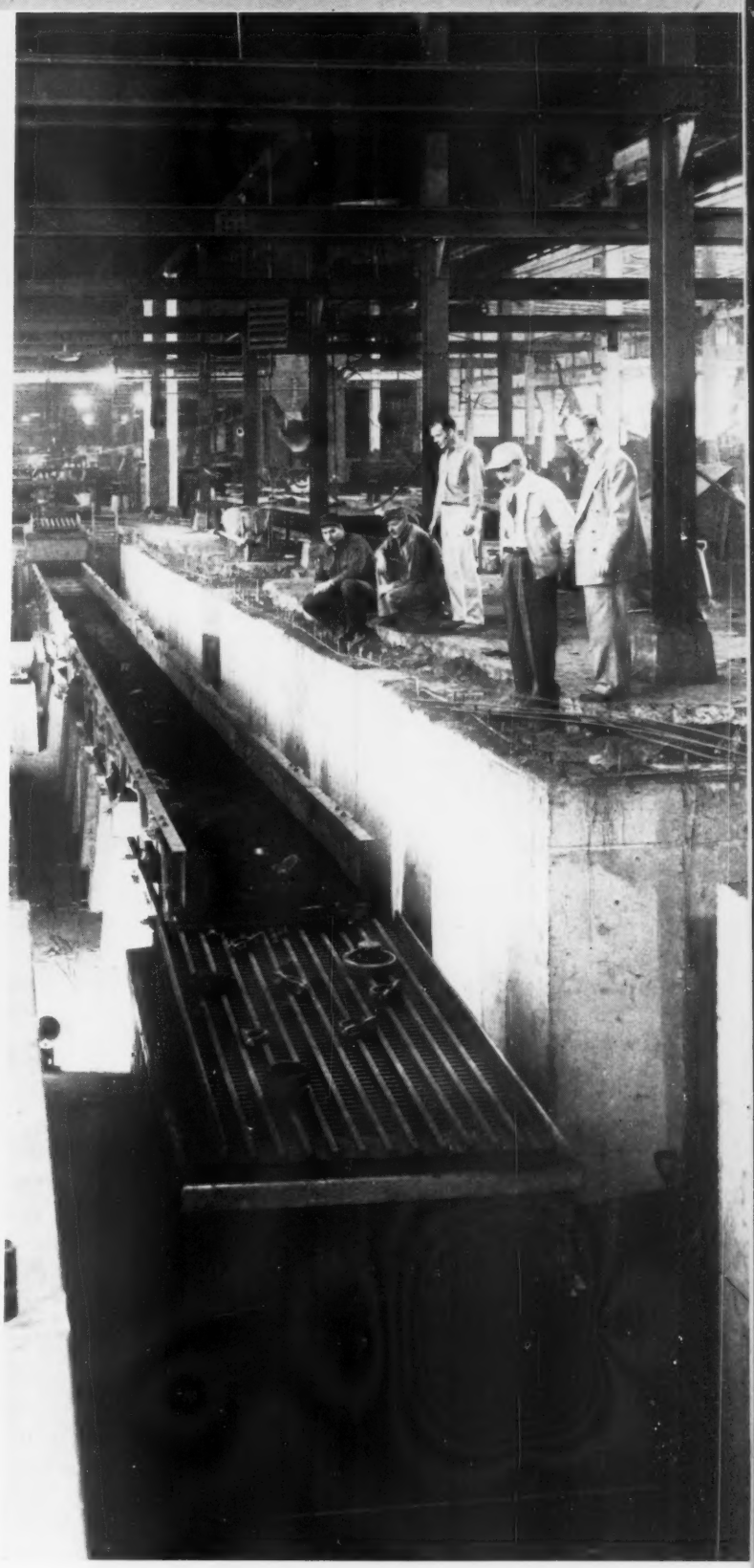


Fig. 9—Oscillating conveyor and shakeouts during construction of mechanized foundry. Sand falls through shakeout in foreground to a belt conveyor

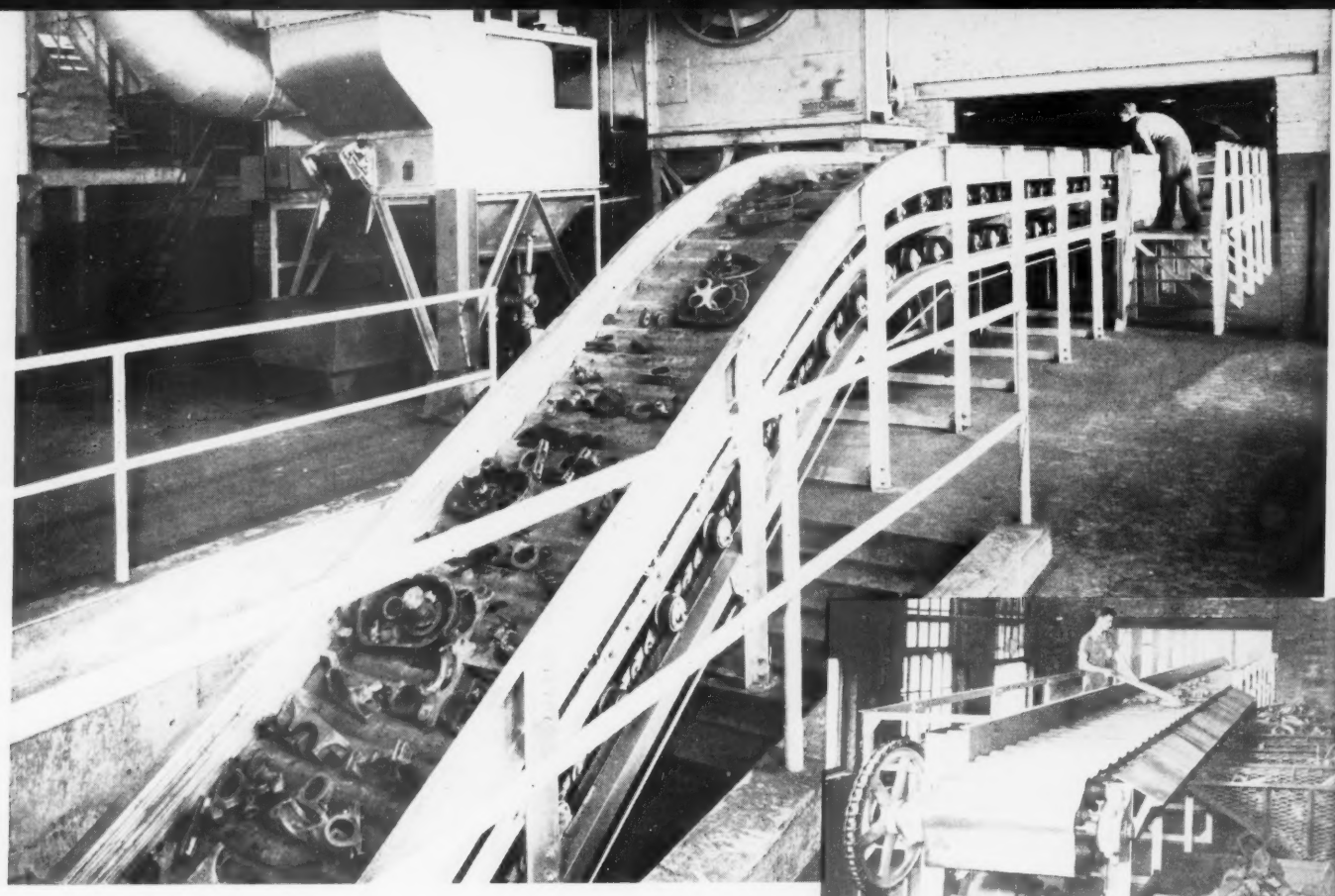


Fig. 10 (above)—Steel apron conveyor carries castings out of the shakeout pit into the sorting, cleaning, and inspection department

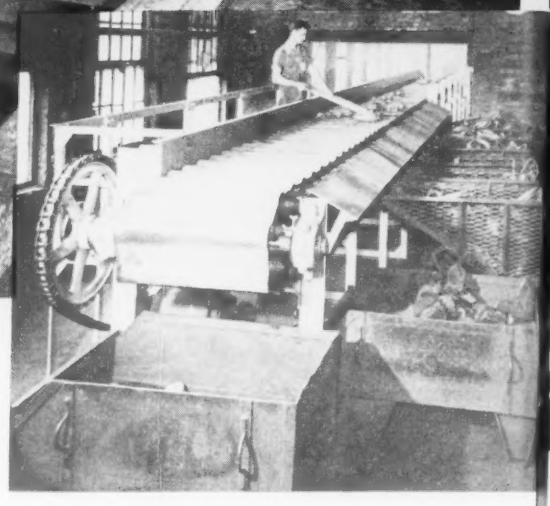


Fig. 11—Castings are pushed off side of conveyor into expanded metal hopper boxes and moved by truck to various cleaning stations

flask, with its mold, is picked up by a pneumatic hoist mounted on a jib crane and swung over the shakeout. Sand and casting fall into the oscillating conveyor. The flask is returned to molder on a gravity roller conveyor.

A view of the oscillating conveyor and shakeouts during construction of the mechanized foundry is shown in Fig. 9. The shakeout just described is visible at far end of the conveyor. The shakeout in foreground separates sand from castings. Castings slide off the end of the shakeout to an apron conveyor which carries them up out of the pit to the cleaning and inspection department. Sand falls through the shakeout unit to a 24-in conveyor belt shown at lower right of shakeout in foreground. This belt operates at right angles to the direction of castings travel and carries sand to the strike-off sand conveyor at the molding end of the mechanized foundry. The sand passes over a magnetic pulley which removes tramp iron and is carried to a revolving screen by a bucket elevator for removal of other refuse. The shakeout sand, along with strike-off sand, is carried from the screen by conveyor belt to storage bins.

The underground pits housing the oscillating, shakeout, and strike-off sand conveyors and the shakeout units are equipped with an exhaust system which transmits dusty and smoky air to two wet type dust collectors. These units have capacities of 24,000 and 30,000 cfm and keep the air clean and fresh.

About 150 tons of molding sand are incorporated in the mechanized foundry sand system. It starts its cycle of travel from two storage bins, with total capacity of 150 tons, located high above floor level. A traveling weigh lorry operating on overhead rails shuttles between these two hoppers immediately below pneumatically operated discharge doors at the bottom of each hopper. The 3000-lb capacity batch-type muller is located directly under one of the hoppers. Properly weighed sand charges are dropped into the muller through manually operated discharge doors in the weigh lorry bottom. Mulling cycle is 5 minutes and makeup of a batch of molding sand consists of 2600 lb of system sand, 25 lb fire clay, 21 lb seacoal, 5 lb of a western bentonite and fire clay mix, and 2 lb of corn flour. These latter additions are made with a hand scoop by the muller operator.

Water additions are measured through a meter, and 12 gal are used for room-temperature sand. However, the amount of water added is determined by temperature of the sand coming from storage; warmer sand, of course, requires more water to compensate for increased evaporation. Temperature of the sand is taken by a bulb located near the bottom of each storage hopper and recorded on a panel-mounted scale for observation by the operator. The scale also shows calculated water additions for the varying sand temperatures encountered. Levers for

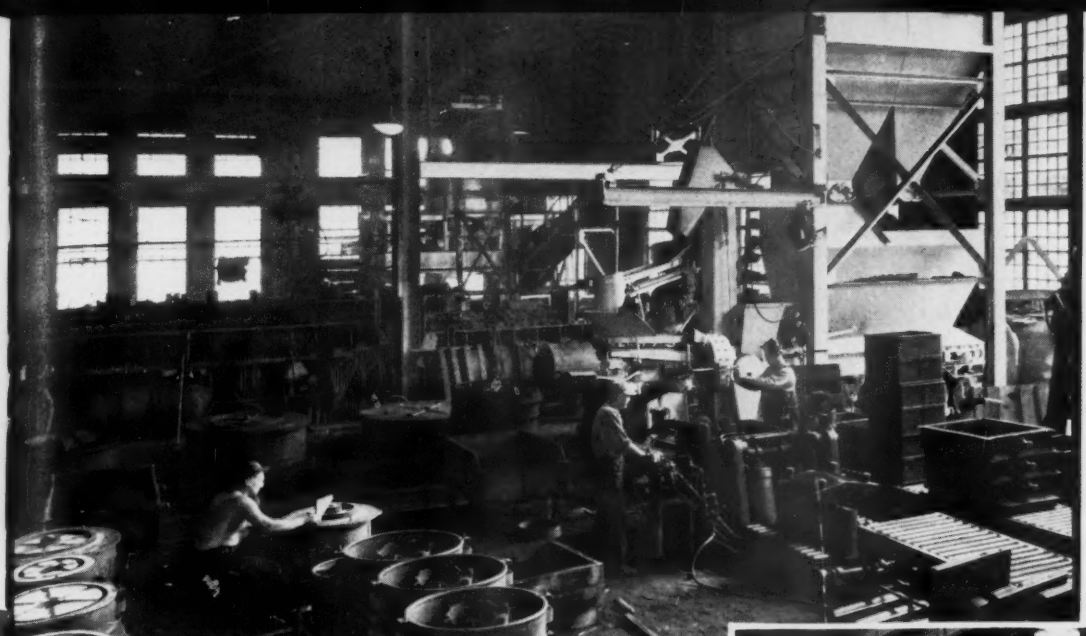


Fig. 12 (left) — Sand-slinger, operated in the south foundry, is shown receiving sand from the overhead storage bin

Fig. 13 — Castings are dumped into a skip hoist which loads the airless blast tumbling machine

Modernized Foundry

controlling the pneumatically operated hopper door, water flow, starting and stopping the muller, and pneumatic doors for discharge of sand from muller to conveyor belt also are located on the control panel. Mulled sand travels a short distance on a floor level belt conveyor to a bucket elevator, which raises it to the overhead distribution belt serving molders' hoppers.

Sand testing equipment is located on the overhead platform on which an operator walks in making adjustments to scrapers for plowing sand from the distribution belt into molders' hoppers. Some of the sand characteristics maintained include green compression strength, 7 to 8.3; permeability at 50 with upper and lower limits of 53 and 47, and moisture at 4.6 to 5.4. Sand preparation is under a quality control program, and test results are plotted on a chart posted in the mulling area for easy reference by the muller operator.

The steel apron conveyor, carrying castings out of the shakeout pit, levels out a few feet above floor level and continues into the sorting, cleaning and inspection department. A man with a stick sorts the castings by size and pushes them off the side of the conveyor into self-dumping, expanded metal hopper boxes (see Fig. 11). Parts of gating systems and chunks of sand are discharged off the end of the apron conveyor into a refuse container. Box loads of castings are moved by electric skid truck to tumbling machines, a 48 x 48 in. airless blast tumbling machine, or for removal of the gating system, depending upon type of casting. The expanded metal boxes facilitate cooling of the castings while they await further processing.

Castings destined for the airless blast tumbling machine are dumped into a skip hoist, which in turn deposits them in the machine. Cleaned castings are deposited from the machine on a wooden apron conveyor which carries them into another section of the cleaning department for inspection and further sorting. Other equipment in the cleaning room consists of tumbling machines, a walk-in sand blast room and the usual stand grinders, chipping hammers, and hand grinders. All castings are visually inspected and gaged. Speed reducer housings, however, receive an additional inspection under black light after being dipped in a fluorescent, oil base penetrant. Cracks and porosity show up under the black light as glowing lines or spots.

Practically all of the castings produced in the foundry are used in company products. Consequently, the company has an extensive machine shop for finishing its castings. (*Please turn to page* 216)

Electric Furnace Melting

FOR STEEL CASTINGS

Deoxidation of steel in electric furnace melting, use of oxygen to speed up the heat, and a description of the coreless induction furnace are included in this third and concluding article on electric furnace practice

By JOHN HOWE HALL
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ELECTRIC furnace steel being as a rule much hotter than open hearth metal, there is more FeO in equilibrium with a given carbon content, when the furnace is tapped. The reaction $FeO + C \rightarrow CO + Fe$ is therefore more apt to take place as the steel cools in the ladle and the molds, with a corresponding risk of the formation of pinholes in the castings. If the heat has not been boiled to wash out to dissolved gases, hydrogen and nitrogen, they will enter the incipient bubbles of CO and enlarge them.

Even if a proper boil has been set up, acid electric furnace steel is more prone to the formation of gas holes than acid open hearth steel of similar analysis. Aluminum therefore, is required to make the steel set solid by reducing the content of FeO further than is possible by the use of silicon and manganese alone. This is particularly true when the castings are poured in green sand molds, as most small acid electric steel castings are. As Sims[9] states, "it already was recognized (in 1885), that aluminum is a valuable aid in preventing certain types of porosity in steel castings. This property of aluminum has been proved and well established in the intervening years until it is now an accepted fact, even though the basic mechanism of its action has not been established definitely."

When the smallest amount of aluminum that will prevent pinhole formation (about 0.025 to 0.05 per cent, or ½ to 1 lb per ton) is added to the steel, aluminum embrittlement is apt to be encountered in a considerable proportion of acid electric furnace heats. As has been shown by several investigators[10], this is due to the shape and arrangement of the non-metallic inclusions in the metal. As explained by Sims and Dahle, when only manganese and silicon are used to deoxidize steel, the MnO and SiO_2 formed unite with some FeO to form an iron-manganese silicate, while part of the manganese reacts with FeS to form MnS.

The solubility of the latter is least when the oxygen content of the steel is high, and increases as the oxygen is reduced. The sulphides and silicates are mutually soluble in each other, but separate upon solidification. With no aluminum addition, the oxygen content of the steel is high, and the solubility of the sulphides low, so that they solidify at an early stage of the freezing of the metal, and have a globular shape, which Sims terms Type I inclusions. Some of them are composed of both sulphides and silicates. Owing to their rounded shape and random distribu-

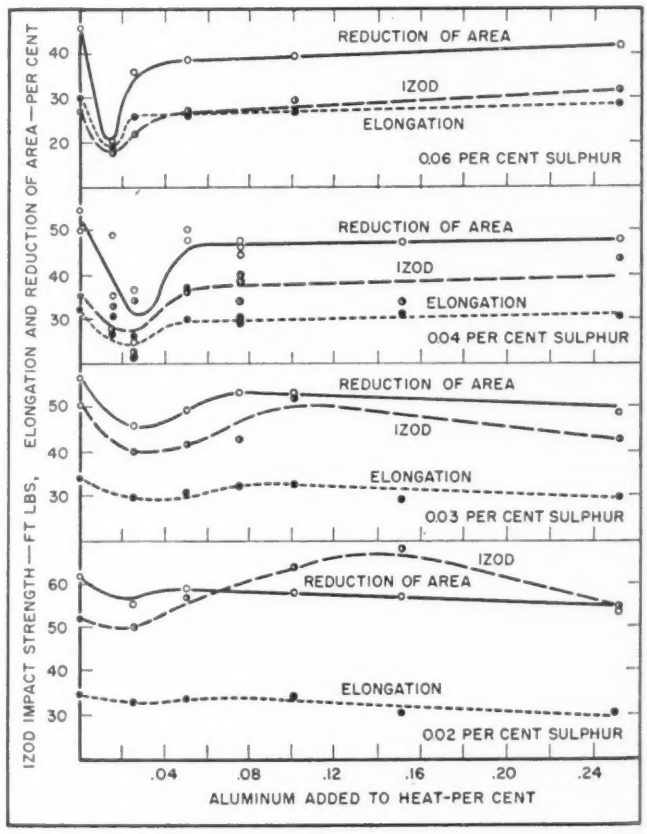


Fig. 1—Quantitative effect of aluminum on ductility and impact strength of grade B cast steels (Sims and Dahle)

High frequency or coreless electric furnaces are arranged for nose tilting to permit smoother pouring. Photo courtesy Ajax Electrothermic Corp.

tion, they have but little effect upon the ductility of the steel.

When small amounts of aluminum are added, the FeO content of the steel and the proportion of silicates in the inclusions are reduced, and the proportion of sulphides increased. Because of the reduction in the oxygen content of the steel, the solubility of the sulphides is increased so much that they separate and solidify late in the freezing of the metal, and take the form of an eutectic with some iron, concentrated in the primary grain boundaries. Sims terms this Type II. Under the microscope, only the sulphides, of course, are visible, and they are in the form of stringers and rows of elongated particles in the primary grain boundaries. These strings of inclusions have been shown to be the cause of the loss of ductility termed "aluminum embrittlement". Naturally, the higher the sulphur in the steel, the greater their amount and their effect upon the mechanical properties. An aluminum addition of ½ to 1 lb per ton of steel (0.025 to 0.05 per cent) produces this type of inclusions.

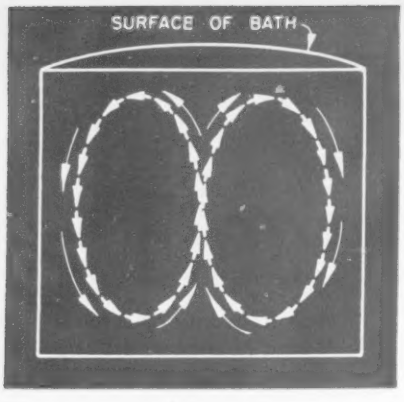
When the aluminum addition is 2 lb per ton of steel, (0.10 per cent) or over, silicate inclusions are no longer found, and some of the aluminum forms Al_2S_3, which unites with the FeS as a double sulphide. The solubility of this compound in steel is low, so that it separates and solidifies early in the freezing of the metal, in large, irregularly shaped masses, termed by Sims, Type III inclusions. These are composed of light-colored FeS and darker portions of Al_2S_3, the latter being more abundant and the FeS less so as the amount of aluminum is increased further. These inclusions, not being distributed in chains and stringers in the grain boundaries, have but little effect upon the ductility of the steel.

Sims and Dahle advised that in commercial practice, 1 lb of aluminum per ton of steel (0.05 per cent) is not enough to insure the production of Class III inclusions, and recommended the use of not less than 1½ lb per ton, (0.075 per cent). To be on the safe side, the industry generally adds 2 lb per ton (0.10 per cent).

Other deoxidizing elements, including titanium, zirconium and beryllium, have an effect similar to that of aluminum, and calcium in the form of a calcium-silicon alloy, in addition to aluminum, is recommended by Gagnebin[11] to secure Type III inclusions and correspondingly good ductility. This recommendation is of interest to the present author, because in 1909 he used a calcium-aluminum-silicon alloy with aluminum, in the production of intermediate manganese steel in a small bottom-blown converter, and found that the only nonmetallic inclusions in the steel were in the form of rounded, pearl-grey spots that he took for manganese sulphides. In any event, they had no adverse effect upon the mechanical properties of the steel, which were uniformly excellent.

As already mentioned, the harmful effect of insufficient additions of aluminum is the greater the higher the sulphur in the steel. This is illustrated by the chart, Fig. 1, taken from Sims and Dahle's paper, which shows the results of tests of small heats of steel made in the induction furnace. From this it is apparent that with a S content of 0.02 or 0.03 per cent, such as is characteristic of basic steels, aluminum additions have but little influence upon ductility, while with 0.04 to 0.06 per cent S, the harmful effect of insufficient amounts of aluminum is pronounced. In all cases, when enough aluminum is added to form Type III inclusions, the ductility of the metal is nearly as good as when it is deoxidized with silicon and manganese alone.

Carefully conducted researches by other investigators[12] have shown that the conclusions of Sims and Dahle are correct for acid electric furnace steel, and for a number of years the standard addition in most shops has been 2 lb aluminum per ton of steel. To what extent the same is true of steel made by other processes is not quite clear, since Gagnebin[11] shows



Pictorial representation of reaction between electromagnetic field and eddy currents in the molten bath

examples of the presence of the harmful Type II inclusions in basic electric furnace steel containing 0.024 per cent S, and in basic open hearth steel in which the S was 0.025 per cent. In both cases the reduction of area was on the low side (27 per cent). In general, however, serious aluminum embrittlement of the type just discussed is nonexistent or at least is not often encountered, in basic steels with low sulphur contents.

Acid open-hearth steelmakers, when they use aluminum at all, are apt to add to the amount that Sims and Dahle found to be the most harmful in acid electric furnace steel. Thus Briggs states[13] "Aluminum is added to the ladle (in acid open hearth work), in quantities of 0.01 to 0.06 per cent, (0.2 to 1.2 lb per ton of steel). Some operators have encountered the low-ductility problem in conjunction with the use of 0.01 to 0.03 per cent (0.2 to 0.6 lb per ton of steel), while others use the critical amount of 0.02 per cent Al and do not obtain a reduction in the ductility of the finished steel." Gagnebin gives no data on acid open hearth steel, and Sims mentions but one heat, to which the safe amount of 0.10 per cent (2 lb per ton), had been added.

The comparative immunity of at least some acid open hearth steel to aluminum embrittlement, even when its sulphur content is comparatively high, is not thoroughly understood. A possible explanation is that the steel is not as hot as acid electric furnace metal, and that in many cases no ore is used, and the carbon is boiled down only to about 0.20 per cent. These conditions would lead one to expect a lower FeO content in acid open-hearth steel. The fact that the metal is seldom gassy, and that the $FeO + C \rightarrow Fe + CO$ reaction apparently occurs to only a minor extent as the steel cools in the molds, points in the same direction.

As already stated, aluminum embrittlement occurs when only enough aluminum has been added to just reduce the excess FeO, so that the solubility of the sulphides is high, and they solidify late as Type II inclusions. A larger amount of aluminum produces double sulphides, which form early-freezing Type III inclusions. If acid open hearth steel contains much less FeO than acid electric furnace metal, it follows that a very small amount of aluminum will reduce it all, and that the additions normally made, though insufficient for electric furnace steel, will produce mostly Type III inclusions in acid open hearth metal. Whatever the true explanation, it is a fact that acid open hearth operators usually do not add any aluminum to their steel when heavy castings are to be poured, and for light green sand work sometimes add the amount of aluminum that produces embrittlement in acid electric furnace steel, and yet are not bothered by low ductility in their tests.

In side-blown converter steel, the author was accustomed to add aluminum in amounts varying from 0.038 per cent (¾ lb per ton of steel), to 0.063 per cent (1¼ lb per ton of steel), and other makers followed approximately the same practice. In the author's experience, a certain number of tests showed woody fracture and low ductility. The coupons with inferior properties were generally those poured soon after the ladle was filled, whereas tests taken from the last half of the same heat would show excellent mechanical properties. Phillips[14] also has reported progressive improvement in the ductility of successive tests poured from shank ladles to which aluminum had been added.

Gagnebin, on the other hand, found exactly the reverse to be true. The author's practice was to toss the aluminum in bar form into the stream as soon as the ladle was filled to a depth of six inches or a foot, and it is quite possible that only enough aluminum had diffused upward into the first metal poured to form the harmful Type II inclusions, and that later, when the aluminum was distributed evenly through the ladle-full, enough was present to produce Type III sulphides. At any rate, coupons showing both good and poor ductility were sent to Mr. Sims for examination, and in every case the low ductility heats were those with Type II sulphides, while only Type III inclusions were present in the "good" samples.

Use of Oxygen—In both basic and acid electric furnaces, the oxygen lance is sometimes employed, partly to hasten the elimination of carbon, partly to heat the bath up more rapidly. The oxygen is fed in at 40 to 50 psi, through a ¾ or 1-in. pipe, attached to the oxygen line by a flexible hose. The lance is pushed well into the bath, below the slag. The charge is proportioned to give a melt-down carbon of about 0.50 per cent, and if the scrap is clean, a little iron ore is charged with it, to start a boil. The oxygen is turned on when the boil has begun, and the "blowing" is continued for from 1 to 5 minutes, the exact time depending upon the amount of carbon to be eliminated. The rate of carbon drop is about 4 or 5 "points" per minute, and roughly 3.4 cu ft of oxygen per ton of metal, are consumed for each point of carbon eliminated. The steel pipes, of course, burn off quite rapidly and their cost must be added to that of the oxygen consumed, in figuring possible savings by the process.

During the oxygen "blow," the electrodes are raised, and if the furnace has a movable roof, it is raised about 5 or 6 in. to allow the fumes and smoke to escape freely. At the end of the blow, the electrodes and roof are lowered, the current turned on, and the heat finished in much the same way as if it had been boiled with ore in the normal manner. In the case of double-slag basic operation, this involves slagging off, forming a new slag and deoxidizing it with coke dust. A single-slag basic or acid heat

would be finished off in 15 or 20 minutes, in the manner already described.

As a rule, the cost of oxidation with oxygen, counting in the value of the pipe consumed, is a little higher than that of the iron ore required to effect the elimination of the same amount of carbon. However, the boil is so much speeded up and so much heat is contributed by the oxidation of carbon and iron, that the time required to make a heat, and consequently the current used, is somewhat less than in normal practice. The overall cost of production, therefore, is reduced. As in open hearth practice, the chief dis-

Filling the ladle with a special high alloy steel. Photo by courtesy of Allis-Chalmers Mfg. Co.

advantage of the method is that such copious reddish-brown fumes of iron oxide pour from all the doors and roof-ring openings as to overtax the capacity even of highly efficient overhead ventilating fans.

At the best, this is a first-class nuisance, at the worst, as in some of our Pacific coast cities, it would not be tolerated. Though little has been said about the effect of these fumes on the brick-work of the furnace, they must shorten the life of the silica walls and roof, perhaps not as much as in open hearth furnaces, but nonetheless to a noticeable extent. They contain quantities of finely divided FeO and to bring this in contact with the silica roof and wall brick at white heat will inevitably promote the rapid formation of iron silicate, and the consequent slagging off of the surface of the bricks. In remelting high-alloy stainless steel scrap, oxygen is used successfully to lower the carbon content without too great a loss of chromium. This practice will be discussed in connection with a description of alloy steel manufacture.

Coreless Induction Furnace — Typical coreless or high frequency induction furnaces are shown in the accompanying illustrations. The furnace proper consists of a crucible mounted in a suitable exterior frame-work, and surrounded by water-cooled copper tubes that carry the primary current. The outer frame is provided with trunnions so arranged that the whole structure revolves about an axis that passes through the lip. As the metal is poured out, therefore, the lip remains at the same point, while the body of the crucible is elevated. When it is desired to pour molds direct from the furnace instead of using a ladle, this is a very valuable feature of the design.

The electrical equipment required to operate the furnace consists of a bank of condensers and a motor-generator revolving at a very high rate and delivering current at several hundred cycles, instead of the 60 cycle used in regular power lines. To avoid overheating the bearings, these heavy, high speed generator sets are usually installed in a room provided with means of filtering the dust out of the air.

Linings Differ with Furnace Size

In the smaller furnaces, preformed crucibles are set in position, and a mixture of refractory material is rammed in between the crucible and mica sheets laid against the copper coils. In larger installations, the lining is made entirely of rammed material. A layer of mortar composed of mullite[15] or other thermal-shock resisting refractory is first spread over the copper coils, and lining material is rammed in to form the bottom. On this is set a wooden or sheet metal plug, and the walls are rammed in between this form and the mullite layer. The top is shaped with a slurry that can be troweled in place. When a sheet metal plug is used, it is generally left in place, to be melted out in the first heat.

Coreless furnaces are sometimes used to melt steels that can be made on an acid lining. For this purpose crushed ganister mixed with a small amount of clay binder, or sometimes with water glass, makes a satisfactory lining. More often, however, a neutral or basic material is required. Fused magnesia, zirconium silicate, and mixtures of magnesia and alumina are used for this purpose. The furnace heats up so quickly that ordinary magnesia suitable for open hearth and arc furnace bottoms, tends to crack badly. The makers of refractories, therefore, have developed special magnesite and magnesia-alumina mixtures, sold under a variety of trade names, which are so proportioned as to resist both cracking and the chemical attack of the slag.

Wilcox[16] states that linings made of one of these materials and used in producing 18 Cr-8 Ni steels, stand up for an average of (*Please turn to page* 239)

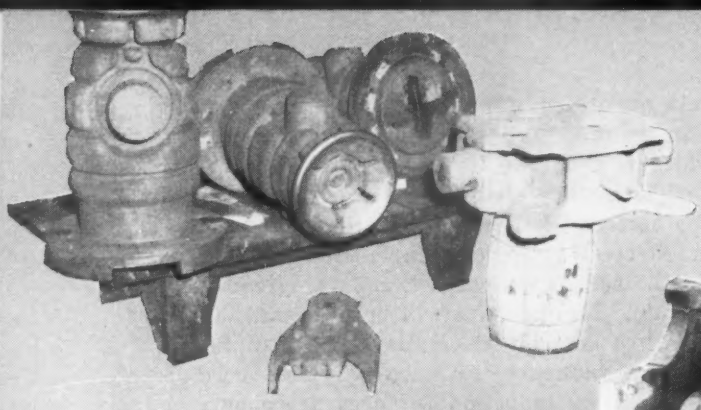


Fig. 1—Completed piston and head cores ready for foundry

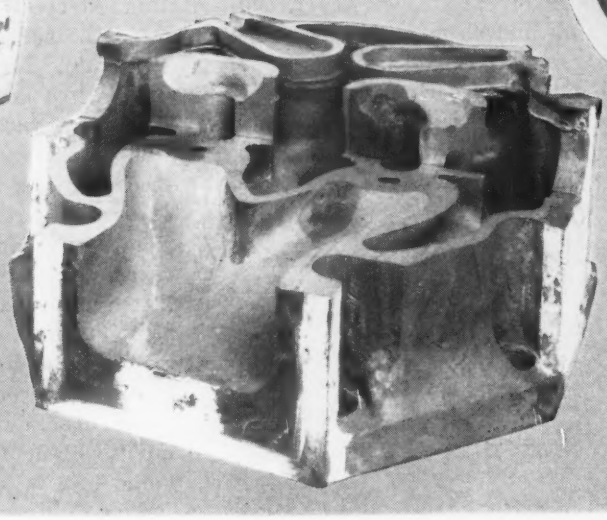


Fig. 2—Showing complicated core work in a cylinder head which has been sectionalized

Fig. 3—Interior view of a piston casting

EFFECT OF BLACKING ADDITIONS

To Core and Molding Sands

By THEODORE H. BURKE
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Buffalo

STUDIES have been conducted for an extended period by the Worthington Corp. on the effect of introducing foundry blacking in oil sand cores for diesel engine and compressor gray iron castings. This investigation had its origin in a search for a suitable but inexpensive material to incorporate in the core sand mixture which would withstand the severe conditions imposed on cores by a large volume of metal surrounding them. The cores are of relatively small cross-sectional area—for example, split cores for the rims, hubs and barring holes in the periphery of the large diesel and compressor flywheels. The relative core and metal cross sections in most of the castings involved were 1 to 15.

The materials used previously for this purpose were very fine and highly refractory metallic oxides which were quite satisfactory but relatively expensive. To reduce the cost of these cores, we endeavored to procure less costly but equally effective materials. Because of our experience with blacking in steel foundry facings, we believed a trial on gray iron work was in order.

Trial mixtures were made up of the following proportions, by weight, of the various materials: Blacking 6 to 10 per cent; Muskegon core sand 28 to 30 per cent; Providence river sand 60 to 62 per cent; and core oil 1.8 per cent. To this mixture was added enough water to bring the moisture content to 5.5 per cent.

Table I shows the AFS fineness tests of the materials involved. Table II gives the chemical analysis of the sands and blacking. The reported analysis of the blacking is not strictly chemical; however, it may be assumed that most of the volatile matter and substance lost on ignition is of carbonaceous composition.

Physical characteristics range of the mixture follows: Green permeability 16-20; dry permeability 30-40; green compression 1.9-2.1; dry compression 300-370; baked shear 80-85; tensile strength 190-200; flowability 70-73; density 98-105; moisture 4.5-5.5. Hot strength after 12 minutes: 500° F—230 lb; 1000° F—65 lb; 1500° F—80 lb; 2000° F—120 lb; 2500° F—25 lb. Shock tests at 2500° F showed very small cracks.

Reference to Table II will show that the components are of a relatively fine nature and for this reason a slightly longer mulling period is required than for the usual mixture. The cores were baked at 400° F for three hours and, as in standard practice, left in the oven until morning.

The sand is prepared as follows: The two grades of sand and the blacking are mulled dry for two minutes and water is added up to one half the required amount. The mixture is mulled for another minute and the oil is added. Then the balance of the water is added and the mulling continued for two more minutes. Splitting the water addition makes for better control of the moisture content in the mixture and fa-

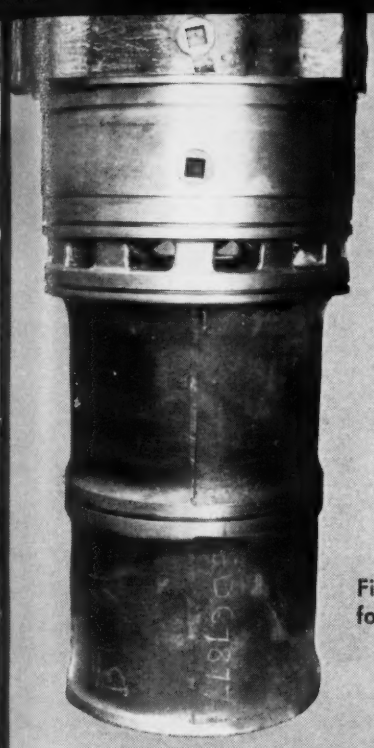


Fig. 4—Liner casting for a diesel engine

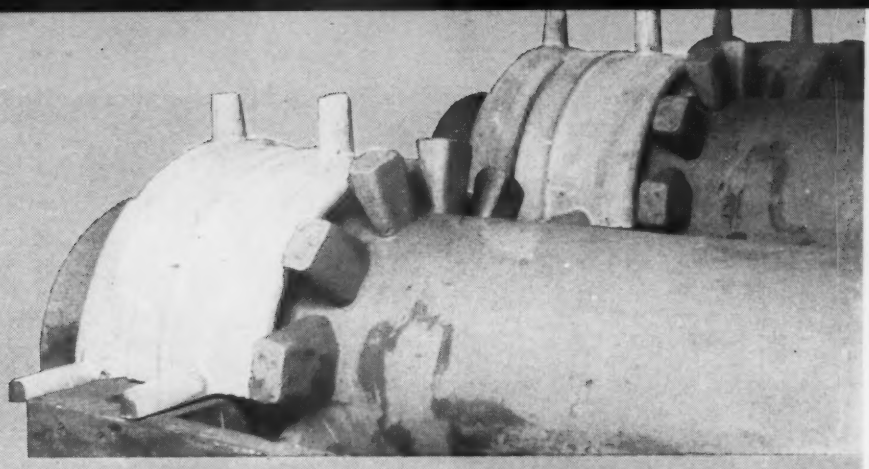


Fig. 5—Water cooler line core in process of assembling

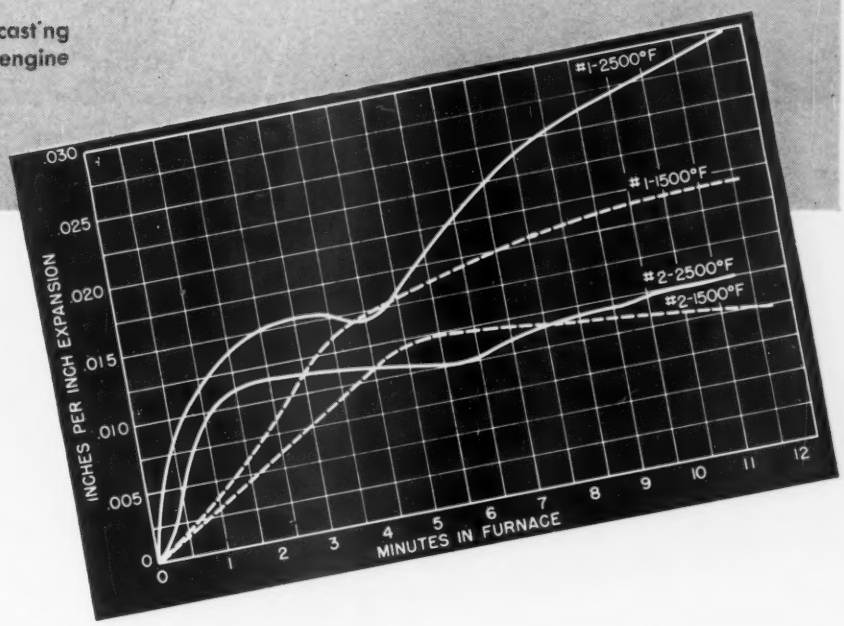


Fig. 6—Expansion curves for the blacking core and molding sands

cilitates its mulling. This mixture, which does a very good job and is well liked by the coremakers, has been our standard mixture for the particular cores mentioned above for over two years.

After using this mixture for several months, further study indicated the feasibility of making a modification of it for use in cores for cylinder head, jacket liner and piston cores in the 400 to 1200 lb weight range. For the cores involving these types of castings, the percentage of blacking was reduced from 10.0 to 6.0 per cent by weight and the Providence and Muskegon sands were each increased by 2 per cent. This mixture proved very successful for these cores.

It should be indicated here that the mixture for the cores just mentioned is used, wherever possible, solely as a facing and is backed up with a lean mixture of core oil with Muskegon sand. This adds further economy and decreases the bake-out time as well.

It was found that the blacking contributed largely to the smoothness of the casting surfaces by preventing metal penetration and the usual expansion and contraction defects. Economies in material and labor costs were effected in core and cleaning departments.

Due to the green dried (*Please turn to page* 234)

TABLE I—Fineness Analysis of Materials

Tyler Sieve Nos.	Blacking	Muskegon Core Sand	Providence River Sand	"Blend" Without Oil
20	...	1.1	...	...
30	...	5.2	...	0.1
40	...	27.2	0.1	0.2
50	...	27.6	0.1	9.5
70	...	23.4	1.7	14.7
100	1.9	8.2	9.8	10.1
140	9.9	3.0	22.9	12.1
200	28.0	1.9	30.3	15.7
270	13.9	.4	10.7	8.0
Pan	45.8	1.8	23.8	28.4
Totals	99.5	99.8	99.4	99.7
A.F.S. Fineness No.	216	50—	167	156

TABLE II—Chemical Analysis of Materials

	Blacking	Muskegon Core Sand	Providence River Sand
Inert matter	47.10%	...	...
Volatile	3.00	...	...
Loss on ignition	49.50	0.32%	0.5%
Silica	...	95.2	86.0
Sulphur	0.50	.007	...
Iron oxide	...	1.07	1.7
Aluminum oxide	...	1.35	10.4
Titanium oxide	...	.05	...
Calcium oxide	...	.35	1.4
Magnesium oxide	...	.04	...
Potassium and sodium oxides	...	1.74	...
Water	.63	...	...

Technical Sessions

at the International Congress

Concluding reports are presented here on the technical sessions held during the recent AFS International Foundry Congress at Atlantic City. See the June issue for reports on the sessions devoted to Aluminum and Magnesium, Brass and Bronze, Patterns, Safety and Hygiene, Sand Shop Course, Refractories, and Gray Iron Shop Course

GRAY iron foundrymen at the International Foundry Congress lowered their sights on a wide variety of topics at eight technical sessions and one roundtable luncheon. Subjects discussed included nodular iron, melting, fluidity, internal porosity, effect of elements such as phosphorus, sulphur, hydrogen and others, and gating and risering.

Opening session, with J. S. Vanick, International Nickel Co., New York, and W. S. Pellini, Naval Research Laboratory, Washington, presiding, was featured by two official exchange papers. Italian exchange paper by Carlo Longaretti and Mario Noris, Institute for Siderurgy Finsider, Genoa, was presented by Mr. Longaretti, and described a new procedure for adding magnesium for production of nodular iron.

Method is to add briquets formed of 50 per cent magnesium chips and 50 per cent graphite bonded with sodium silicate. Briquets are porous and also contain three small holes to permit penetration of the molten iron. Briquets are placed in a plunger or phosphorizer and immersed mechanically into the ladle of molten iron under a hood which prevents injury to operators and carries away smoke and fumes. About 60 per cent recovery of magnesium is obtained. Cost of treatment was given as $1.50 per ton or about one-fifth that using nickel-magnesium alloy or one-eighth that for copper-magnesium alloy.

In the discussion it was brought out that the treated iron has a tensile strength for the ferritic type of over 85,000 psi with a yield strength of about 65,000 psi; for the pearlitic type the values are 77,000 psi and 50,000 psi with an elongation of 5 per cent, both in the as-cast state. With heat treatment elongation is 15 per cent for phosphorus under 0.5 per cent, and 10 per cent for phosphorus over 0.5 per cent.

Second paper, by Corrado Galletto, Centro d'Informazioni del Nickel, Milano, Italy, described production of heavy gears in spheroidal or nodular iron. Interesting part of the author's presentation was a special tooth forming machine which indexes mechanically and provides the proper tooth spacing. In response to questions the speaker said both electric furnace and cupola irons were used. The former had a sulphur content of 0.05 per cent while the cupola iron contained 0.07 per cent. The nodular iron had a tensile strength of 90-100,000 psi and 3 to 5 per cent elongation.

Panorama of the AFS Foundry Show, which combined with the technical sessions to claim the attention of visitors to the recent convention in Atlantic City

Concluding paper was the official French exchange on "Gases and Naturally Occurring Blowholes in Foundry Practice" by A. M. Portevin, Institut de France, Paris. In the author's absence his colleague, Dr. Marcel Ballay, said that M. Portevin's contribution practically was a book on the subject, and covered all phases of how gases are picked up by molten gray iron and their effect or appearance in the solidified product.

The next session, under the direction of J. D. Sheley, Black-Clawson Co., Hamilton, O., and R. A. Clark, Electro Metallurgical Division, Detroit, dealt with melting. The first paper, by H. W. Lownie Jr., and C. T. Greenidge, both of Battelle Memorial Institute, and D. E. Krause, Gray Iron Research Institute, Columbus, O., on how iron and steel melt in the cupola, was presented by Mr. Lownie. Data obtained indicated that the order of melting is pig iron, cast iron remelt and steel. Surfaces of the materials were decarburized and melted from the inside out. Large part of the steel is melted by being washed with the earlier melting pig and cast scrap.

W. W. Levi, Lynchburg Foundry Co., Radford, Va., described a watercooled, basic-lined cupola with hot air blast for producing low-sulphur, high-carbon irons from charges containing about 70 per cent steel scrap. Cooling is accomplished with 60 equally spaced, 2½-in. diam seamless steel tubes which are installed vertically above the tuyeres. Twelve water-cooled copper tuyeres are used and project at about 12½° angle downward into the cupola, extending about 9 inches beyond the interior diameter.

R. Doat, Compagnie Generale des Conduites d'Eau, Liege, Belgium, discussed a paper prepared in cooperation with M. A. DeBock, Brussels, Belgium, on the "metallurgical blast cupola" (see November, 1950 issue of FOUNDRY). He pointed out that this cupola, using all scrap charges, could produce a variety of compositions by adjusting the slag composition. No pig iron is necessary, and where an appreciable price differential exists between scrap and pig iron, the unit can be amortized in a short time. Refractory consumption is about 2 lb per ton of metal. High-sulphur, high-ash coke can be used. Slag produced is low in FeO, and when granulated can be sold for cement making. Sixty per cent of the gas (889 cal/cu m) produced is available for fuel.

At the third session papers on the basic cupola, fluidity of gray iron, and effect of phosphorus were presented. James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., and T. J. Wood, American Brake Shoe Co., Mahwah, N. J., presided. Sam F. Carter, American Cast Iron Pipe Co., Birmingham, Ala., related some production experiences with the basic cupola. He said that blown dolomite patching gave the lowest refractory cost of $1.85 a ton. Graphite and carbon slag-hole blocks are resistant to slag but the hole gradually burns larger from escaping air blast when left open.

With front slagging a taphole made up of high-alumina brick serves for two or three shifts. Runner box behind the slag knife is lined with magnesite brick with an inner lining of rammed dolomite which is patched daily. Slag overflow and runoff trough are lined with thin graphite or carbon blocks which last two or three weeks. Mr. Carter stated that while it costs more to operate the basic cupola, this is offset by improved metal quality or by use of cheaper raw materials.

Factors which affect fluidity of gray iron was the subject of a paper by L. F. Porter and P. C. Rosenthal, University of Wisconsin, Madison, Wis., which was presented by Mr. Porter. From their studies the authors concluded that normally the mechanism of freezing determines the effect of composition on fluidity. Carbon has the greatest influence on increasing fluidity of hypoeutectic cast iron, with phosphorus half as effective and silicon one-fourth as effective as carbon. Manganese reduces fluidity of hypoeutectic iron but has (*Please turn to page* 144)

QUESTIONS

Information About Matchplates

Q.—We would like information on making matchplates. What flask should be used or is best suited for this? What sand gives the smoothest surface, and what is generally used? Is there any literature on the subject?

A.—Size of flask for making an aluminum alloy matchplate will depend upon the dimensions of the matchplate. Roughly it should be about 6 in. wider and about 12 in. longer than the plate; the additional allowance on the length is required to form the ears on the plate. The flask preferably should be metal to provide stiffness or rigidity, but may be of wood if made sturdy enough.

Choice of sand largely will depend upon what you have available, and generally the best sand is a compromise. As you know, the finest sand will give the smoothest surface, but it also tends to cause blows due to tightness or lack of permeability. Hence, you will have to choose a sand which, while possessing the necessary permeability, also is fine enough to provide the desired smooth surface. For example, you might try a sand with a grain fineness of 210 to 260, a clay content of 15 to 22 per cent and 6 to 7 per cent moisture content.

At various times the procedure in making matchplates has been described in the literature. Some of the details may be found in *Pattern Making* by Ritchey, Monroe, Beese and Hall, and also in *Pattern Design* by Hall and Kiley.

Cores and Molds for Radiators

Q.—We shall appreciate information regarding American foundry practice in the production of steam and hot water radiators.

A.—Under present conditions the great majority of radiator castings are molded, poured, shaken out, cleaned, tested, machined and assembled on conveyor units. In many plants a mechanical device rams the sand in a manner approximating hand ramming. In other plants the molds are made on jolt squeeze machines. Plain, strong flasks are used, with no bars in the smaller sizes and only one or two in the larger sizes. The bars are designed primarily to prevent the flasks from spreading. Metal patterns split along the center line are mounted either on plain plates or on stripping plates and are dropped a short distance before the cope or drag is lifted.

Special chaplets known as radiator chaplets, consisting of a wire stem and a $\frac{1}{2}$-in. square base, are rammed up with the pattern. The stem rests in a hole in the pattern, the same depth as the desired thickness of metal in the casting. The square base is sufficient to support the weight of the core in the drag, and to resist the upward pressure of metal in the cope. Number of chaplets depends on the size of the core. Sand in the mold is open and permeable to permit the free escape of gas and steam without the necessity of using a vent wire.

Sharp sand bonded with oil is used for making the cores. Each core is made as a complete unit with a vent channel in the center of each section leading to a vent opening at one or at both ends. The two half cores made in adjoining half coreboxes are booked, placed in a dryer shell as a unit and then dried in an oven. Detailed description of methods and equipment employed in many prominent American radiator foundries has been presented in FOUNDRY on many occasions. The latest description in which a practically automatic performance is directed from a control panel was published in the April, 1950 issue of FOUNDRY.

Product is Pearlitic Malleable

Q.—Please send us any information on the metal used for manufacture of automotive parts similar to that being produced by a number of foundries under the name of "Arma Steels." Chemical composition is as follows: TC 2.45 per cent, Mn 0.56 per cent, P 0.101 per cent, S 0.076 per cent, Si 2.33 per cent, Ni 0.08 per cent, Cr trace, Mo 0.16 per cent, Cu trace. Hardness Rb 93-94, Bhn 200-205. Structure is as follows: Pearlitic malleablized cast iron, disintegrated pearlite with tendency towards spheroidizing nodular type graphite with graphitization occurring in and adjacent to the graphite.

A.—"Arma Steel" is a pearlitic malleable iron developed by General Motors Corp., and that firm has the copyright to such tradename. It is made by what is known as the "arrested anneal" process in which iron of approximately regular malleable composition is air-quenched from high temperature and then drawn at a lower temperature. Physical or mechanical properties depend on drawing or tempering temperature and length of time at the temperature.

Arrested anneal method is only one of several for producing pearlitic malleable. Others include addition of elements which retard graphitization, and reheating regular malleable iron followed by quenching and drawing. As in the case of the first-mentioned type, properties of the resultant material may be varied by heat treatment.

The pearlitic malleable you mention is melted by

and Answers

the duplex process using the cupola-electric furnace combination. Castings are heat treated in continuous type furnaces, which are zoned to obtain desired temperature differentials. In general, the castings are heated to 1650°F, held at that temperature for a period of time, quenched in a cooling zone in the furnace, and drawn at 1250°F for 8 hours.

Production of pearlitic malleable, like many other materials, requires close control of composition and heat treatment to obtain consistent properties in the resultant product. While the analysis you mention conforms in general to composition requirements, it should be pointed out that the silicon content is about 1 per cent too high.

Is Not Suitable for Aluminum

Q.—We would like to have any suggestions and information regarding melting aluminum in a cupola. An order for several aluminum castings weighing 475 lb have been placed with us, and as our capacity is only 200 lb from two coke-fired furnaces, we wonder if a cupola could be used. We now have a cupola lined to 22 in. that has not been used for some time, but could be put in operation for a small cost. Any information, methods of operation, etc., will be appreciated.

A.—While use of the cupola undoubtedly would solve your problem as far as capacity is concerned, it unfortunately is not suitable for the purpose because the molten aluminum comes into intimate contact with the gases of combustion, particularly with water vapor as such or in its dissociated state. The water vapor is in the air used to supply the cupola blast. Naturally with such conditions existing, not much imagination is needed to picture the kind of aluminum that would appear over the spout.

Make Abrasive-Faced Castings

Q.—We noted some time ago in FOUNDRY a description of making abrasive-faced aluminum castings, but we cannot find it. Now we have several small treads about 4 x 6 in. on which the customer has requested an abrasive top. Can you give us the procedure?

A.—Production of abrasive coated castings of nonferrous and ferrous alloys requires some skill and experience to make satisfactory work. Essentially the method is to coat the mold face after the pattern is drawn with some type of adhesive such as molasses water, thin clay wash, sulphite liquor binder, a solution of bentonite in water with or without sodium silicate, a solution of sodium silicate alone, etc. It is preferable to have the coating fluid thin, and spray it on to obtain uniform thickness as well as the minimum amount.

Abrasive grit, usually silicon carbide in 30 to 36 grit or grain size, then is sieved or sifted over the sticky surface in a uniform thin layer, using a sieve or screen of the same mesh as the abrasive. It may be advisable to spray the first layer with the adhesive and apply a second thin coat of abrasive. Coated surface is torch dried sufficiently to drive the moisture away from the face so that the metal will lie quietly against it. Metal should be good and hot when poured so that it will penetrate between the abrasive grains as well as partially fuse to them.

Chill Depth Is Insufficient

Q.—We are making a chilled iron trunnion which measures 15 in. OD, 6 in. ID with a 5 in. flat face. It is machined and ground and should be free from all surface defects. At present we are using a cast iron chill that is 6 in. thick, but are having difficulty getting more than ⅛-in. depth to the chilled surface. Can you advise how we can get a chill depth of ¼-in. or more on the trunnion?

A.—With the 6-in. chill you are using you should not have any difficulty in securing better than ¼-in. chill depth on the casting, provided the silicon content of the iron poured against it is suitable for a 4½-in. section, or the wall thickness of the trunnion. We believe that the silicon content should be 1.25 per cent or below.

If you have only a few trunnions to make each

GANGWAY!

By J. A. PATTERSON

"Blast it, Officer—I tell you I am not parked by a fire plug!"

day which does not warrant changing the mixture, you might be able to offset the higher silicon content of the iron by use of chromium, for example. Since we do not know your present silicon content we cannot suggest the amount of chromium to be used, but you could determine it by considering that the chill-inducing effect of 1 part chromium approximately balances the chill-restraining effect of 1½ parts of silicon. For example, if your present silicon is 2.30 per cent, it has 1.05 per cent more than is desired, and on the basis mentioned, 0.7 per cent Cr should be added or 1 lb of ferrochromium (70 per cent) per 100 lb of iron.

Another method would be to coat the chill with dilute tellurium paste or wash, or by adding tellurium to the ladle. Tellurium is a drastic chilling agent and only a small amount should be added to the ladle, say not over 0.1 per cent or 1.6 oz per 100 lb of iron.

Wants Data on Riser Sleeves

Q.—We read the article "Insulation Increases Riser Efficiency" in the December, 1950 issue of FOUNDRY, and are interested in trying the procedure. However, we would like more detail on the material used. Is it a special product sold in your country or can the user prepare it himself, and how? We have made trials with an English product, but had the impression that it had an aluminum and magnesium base, and fearing contamination of the metal, stopped the trials although we obtained a 75 per cent reduction in riser weight. Also the English product is expensive.

A.—The material used for the insulating sleeves described in the article mentioned, we understand, is metal casting plaster, and available in the form of sleeves of different sizes ready for use from several firms. Presumably, since you are a long way from the source of supply, you could experiment by making your own from metal casting plaster which is a dry compound containing 4 parts of gypsum and 1 part of fibrous talc by weight with 1 per cent terra alba (kaolin) to control the "set." Such material is available already mixed or the ingredients may be purchased separately.

Amount of water used with the dry material may vary from 1.4 to 1.8 lb to 1 lb plaster. In mixing the dry material always is scattered into the water, and mixing preferably performed with an electrically driven propeller or disk for a few minutes until it assumes a creamy consistency.

As pointed out in the article you mention, the plaster or gypsum sleeve must be dry when the molten metal comes in contact with it. Usual practice, except where production plaster molding is employed, is to dry plaster molds at 350 to 400°F for 10 to 12 hr. However, since the sleeves you contemplate making will have walls only about 1 in. thick as compared with a mold several inches thick the time required for drying should be considerably less than indicated. Best method of ascertaining when the sleeves are dry is to insert a thermocouple in the center of the wall and observe when the temperature of the oven increases to around 300°F. As long as the plaster contains moisture the temperature will not rise over 212°F.

Another method to determine whether the plaster is dry is by weighing. With the slurry consistency mentioned (up to 1.8 lb water per 1 lb plaster) it will be necessary to dry the mold or sleeve until it has lost about 60 per cent of the weight in the moist state. Sleeves should be used while still warm as the plaster will pick up moisture when cold. As the article points out the moisture pickup can be circumvented by placing the warm sleeves in heat-sealed plastic bags until they are used.

Another material which might be used instead of plaster is perlite, a heat-expanded volcanic rock in powder form. Suitable mixture is 25 qt perlite, 2 qt high-early strength portland cement, 1 qt bentonite, and 5 qt water. Dry ingredients are mixed first and water added. Sleeves are baked for 4 hr at 350-400°F.

Your description of the English product seems to indicate that it is an exothermic refractory material which may contain nitrates, metals, and metal oxides. When that material is ignited by the molten metal, it creates considerable heat which keeps the metal liquid much longer than usual. It is our understanding that such material does not contaminate the metal.

Steel Thrown Out of the Ladle

Q.—For many years we have melted and poured electric steel with a crew of experienced operators. The metal is teemed from a bottom-pour ladle 30 in. diam, 36 in. high, lined with brick and daubed with fire clay. Recently the ladle was filled with metal and transported to the pouring floor in about 4 minutes. Just before the stopper was lifted over the first mold a violent explosion threw most of the metal out of the ladle. Like a tidal wave, the metal rose up and flowed over the entire top rim of the ladle. We have consulted several steel foundrymen but have received no satisfactory or, in fact, any explanation. Have you any knowledge of an accident similar to this?

A.—We have interviewed men in a position to give an opinion on the possibility of impure aluminum having caused the trouble. The consensus appears to be that if the aluminum had been responsible, the explosion would have taken place at once when the aluminum was added to the steel in the ladle. This agrees with our own experience—the explosion comes immediately. In our opinion the explosion was caused by moisture in the ladle lining. Possibly the ladle shell had no vent holes or, if vent holes were present, they were plugged. Therefore, the steam could not escape outward as it should.

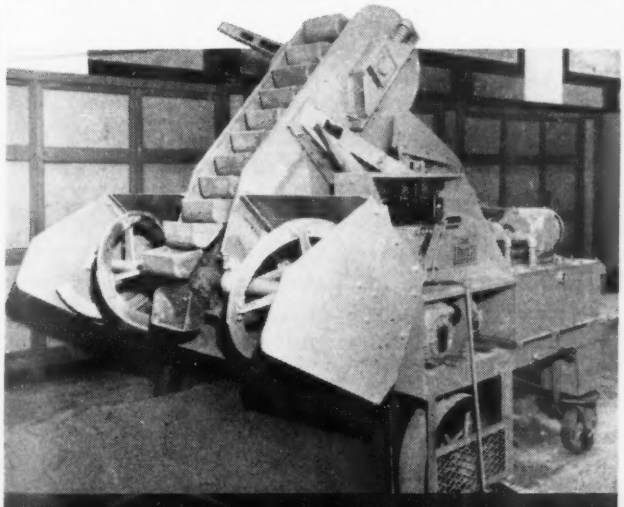
A possibility exists that in this particular instance the ladle lining was not thoroughly dried out. Steam forced its way into the metal from all sides except

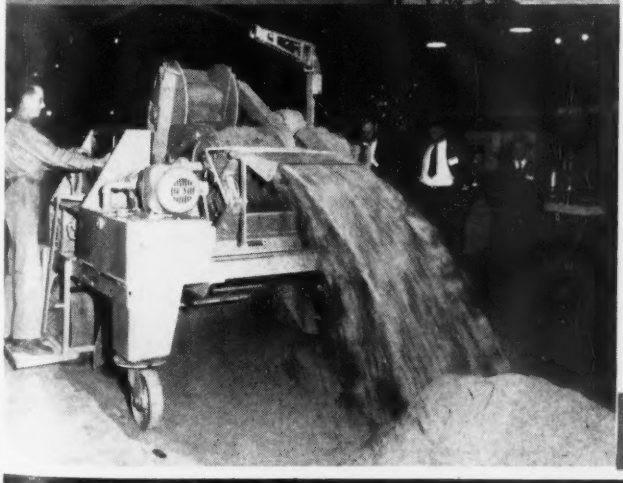
(*Concluded on page* 118)

ROYER Sand Hog

"star of the Foundry Show"

fully mechanized sand preparation with *magnetic separation*





Foundrymen at the Atlantic City Convention displayed a great amount of interest in the new Royer SAND HOG, the latest in the line of Royer completely mechanized sand preparation units. Hydraulically powered with variable speeds from 1' to 85' per minute, it travels into the heap of unconditioned sand, scoops it up and completely conditions from 40 to 60 tons per hour, depending upon the type and temper of the sand.

A magnetic pulley, 15" in diameter and 22" long, provides complete magnetic separation . . . all scrap, shot and nails are removed, often resulting in the elimination of the need for riddling. The sand is then combed, blended and aerated and, thoroughly conditioned and scrap free, is discharged from the rear of the machine.

The unit is extremely maneuverable, can be turned in a 5½' radius, travels over a 30" windrow of sand by hydraulically raising scraper and screw. Speed changes are rapid with instantaneous reversing.

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FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER FOUNDRY & MACHINE CO.

159 PRINGLE ST., KINGSTON, PA.

QUESTIONS and Answers

(*Concluded from page* 116)

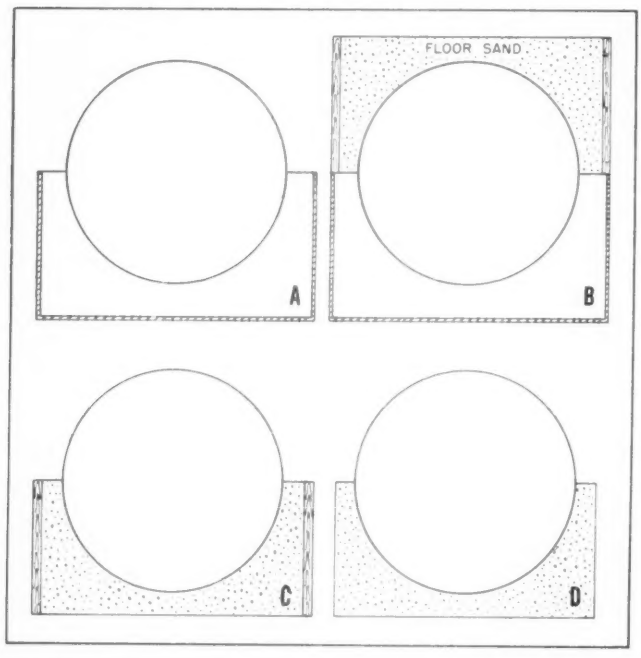
the open top. The accumulated and final pressure was sufficient to lift the mass of metal and throw it out over the top of the ladle. If the moisture resulted from an improperly dried patch on the bottom lining, the explosion would have been sudden and violent long before the ladle was filled with metal. The result would have been like a fiery erupting geyser. If the entire lining was moist some inches below the surface, it would have taken a few minutes for the steam to generate sufficiently to boil the ladle over in the manner described. The foregoing is merely an opinion, since we never have seen, heard or read of a similar occurrence.

Roll Core Over in Black Sand

Q.—We are making round cores from 1 to 5 in. diam, 12 in. long, from a cement sand mixture. They are so weak in the green state they fall apart when turned out on a flat board or plate. Do you know where we can procure plates with a semicircular depression into which the cores may be rolled from a split cast iron corebox.

A.—Manufacturers of extrusion type coremaking machines supply corrugated trays to receive the cores as they leave the machine. Several solutions to your problems are available, depending to a considerable extent on the volume of production. Drier shells—light metal castings conforming closely to the size and shape of one-half your corebox—may be either iron or aluminum. Plaster or well dried shells made of the cement sand mixture will serve. In this particular case where the cores are not dried in the oven, shells may be made of wood.

When only a comparatively small number of cores are made at any one time, the device and method shown in the accompanying illustration serves satisfactorily. *A* shows the metal corebox with core in place and with one half the corebox removed. A light wood frame open top and bottom is placed over the core and filled with floor sand as shown at *B*. The assembly is rolled over and the iron half corebox is removed, leaving the core resting in the green sand cradle. This step is shown at *C*. Finally the wood frame is removed, leaving the core resting snugly in the mound of green sand. In the sketch the frame is shown with straight sides. A slight taper will facilitate removal.



Diagrammatic representation of the various steps employed in rolling the core over in black sand bed

Constructing a Small Cupola

Q.—We will appreciate information regarding specifications for building a small laboratory cupola with an inside diam of 14 to 16 in. We would like to melt approximately 200 to 400 lb per hour with a pouring temperature of 2750°F. Your comment on plans for a cupola of this size as well as recommended refractories, height of stack, blower size, tuyeres, etc. will be welcome.

A.—Actual experience with a 15-in. ID cupola shows a melting rate of about 1800 lb per hr, according to Holtby in the August, 1941 issue of FOUNDRY. The 10-in. ID diam cupola at Battelle Memorial Institute melts about 660 lb per hr. Both rates are considerably in excess of what you desire, but probably can be reduced to some degree by decreasing the rate of the air blown into the tuyeres.

Cupola described by Holtby was made from two 24-in. diam 3/16-in. shell, hot water tanks which were 54 in. high. It is equipped with four 3½-in. diam tuyeres. Position of tuyeres is adjustable, lowest position being 15 in. above the bottom plate, giving a crucible or reservoir holding 200 lb iron. Blower supplies 350 cfm of air per minute, and gives a melting rate of 1800 lb per hr. As previously mentioned, you would have to experiment to determine how much you could reduce the rate of air flow, and still obtain iron of the proper temperature and characteristics.

Coke splits or charges are 15 lb, and the iron charges are varied from 120 to 150 lb depending on whether an 8 to 1 or 10 to 1 ratio is desired. Since the cupola is small the coke and iron sizes must be adjusted to get the best results. Holtby indicates that 2½ x 2½ x 3-in. or 3 x 3 x 3-in. coke gives good results, and the maximum size for the iron is 5 in. Bed height is determined from the formula H equals 10.5 times the square root of the pressure in oz per sq in. plus 6. In other words, with a pressure of 9 oz the bed height above the tuyeres should be 37½ in.

According to Holtby, the bed after ignition should be allowed to soak not less than 3½ and not more than 4 hr to obtain good hot iron at the start. Three lb of limestone, on top of the bed and succeding coke splits, is used as a flux. Lining of the cupola is composed of standard arch firebrick, each tier containing 20 No. 2-arch and 9 No. 3-arch bricks to give the inside diam of 15 in.

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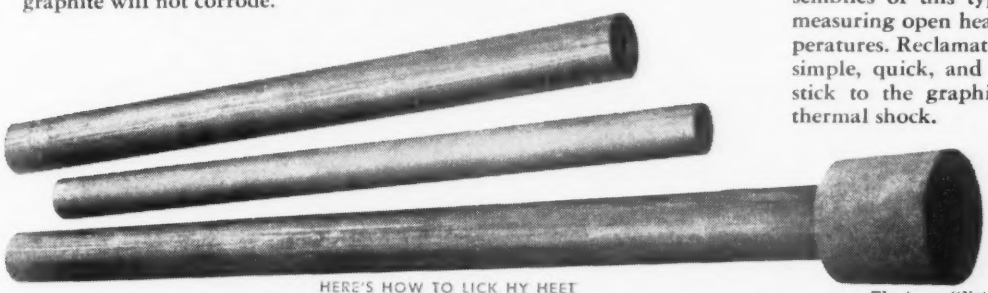

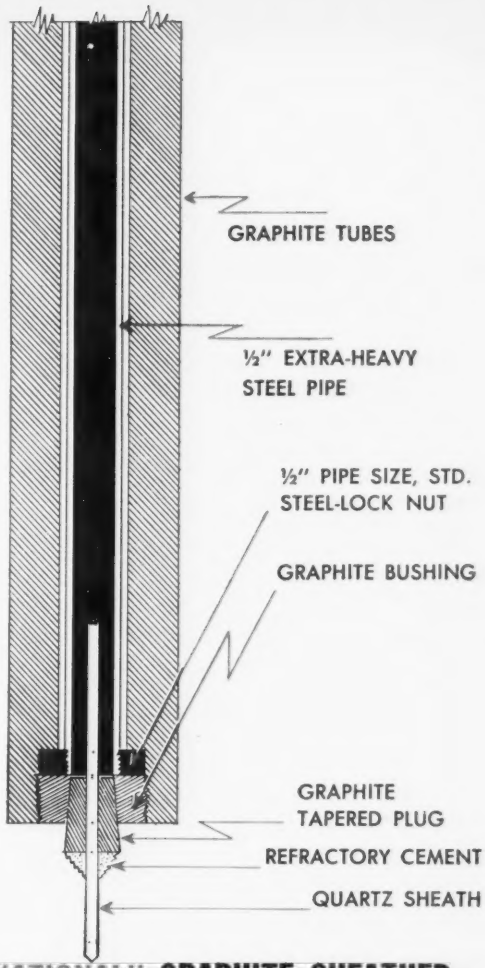

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Only graphite could provide the degree of low-cost, trouble-free protection required by thermocouple assemblies of this type for the immersion method of measuring open hearth and electric furnace bath temperatures. Reclamation and maintenance for re-use are simple, quick, and economical. Molten metal won't stick to the graphite parts and they're immune to thermal shock.

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MEN of Industry

WALTER W. EDENS has joined the sales engineering staff of Federated Metals Division, American Smelting and Refining Co., New York, where he will be concerned primarily with foundry sales. Mr. Edens for the past year has been defense projects executive, Alloy Engineering & Casting Co., Champaign, Ill. Previous connections included vice president, Badger Brass & Aluminum Foundry Co., Milwaukee, and Ampco Metal Inc., there, where he was chief metallurgist and foundry superintendent. Recently he also served as a member of the technical advisory committee to the Foundry Industry Committee of the Munitions Board.

♦ ♦ ♦

Charles F. Scherer has retired as vice president-general manager, Davenport Machine & Foundry Co., Davenport, Iowa, following 42 years with the company. Mr. Scherer joined the company in 1910 as a machinist, became machine shop foreman a year later, and general superintendent in 1923. Later he was made general manager and since 1938 has been vice president-general manager of the molding machine company. Active in technical organizations, he is a past president of the Quad City Chapter of the AFS, Tri-City Chapter of the ASM and last year was a member of the national board of directors of Gray Iron Founders' Society.

♦ ♦ ♦

Lester N. Shannon, who was elected president of the International Committee of Foundry Technical Association at the recent annual meeting in Atlantic City, is vice president and general manager of Stockham Valves & Fittings Inc., Birmingham. He joined that company following graduation from Birmingham Southern College in 1912. Active in affairs of the American Foundrymen's Society, Mr. Shannon was one of the organizers and first chairman of the Birmingham District Chapter, and national president of the AFS in 1939-40. He served last year as vice president of the International Committee.

♦ ♦ ♦

George P. Fisher, formerly vice president of the Whiting Corp., Harvey, Ill., with which he was associated for more than 30 years, has joined the National Production Authority, Washington. He will assist Francis E. Fisher, chief, Foundry Equipment and Supplies Section, Metalworking Equipment Division. Mr. Fisher left Whiting last year to join a group of foundry consultants working with the Economic Cooperation Administration in Europe.

♦ ♦ ♦

Benton W. Norton has been appointed general superintendent of blast furnaces, Shenango Furnace Co., Pittsburgh and of the ingot mold foundries of its subsidiary, Shenango-Penn Mold Co., with headquarters in Sharpsville, Pa. Mr. Norton, who succeeds the late William J. Menke, for 7 years was associated with National Tube Co., since 1948 as division superintendent in Lorain, O.

♦ ♦ ♦

W. C. Snyder Jr., president, Blaw-Knox Co., Pittsburgh, has been named to the additional post of chairman of the board of directors.

♦ ♦ ♦

William M. Black, president, American Manganese Steel Division, Chicago Heights, Ill., and vice president of the parent company, American Brake Shoe Co., New York, was recently honored for 40 years of service with the company at a luncheon given in Chicago. Mr. Black became the first apprentice of American Manganese in 1912, following graduation from University of Chicago. He

(Continued on page 122)

WALTER W. EDENS
. . . joins Federated Metals

CHARLES F. SCHERER
. . . Davenport v. p. retires

LESTER N. SHANNON
. . . heads International group

GEORGE P. FISHER
. . . NPA executive

WOODWARD IRON COMPANY

WOODWARD, ALABAMA

Independent Since 1882

GENERAL SALES OFFICES:

1515 First National Building • Birmingham, Alabama • Phone 54-1667

JOHN M. PRICE
. . . OPS section chief

JAMES A. McGLONE
. . . Whiting sales, Chicago

JAMES W. HALLOCK
. . . Albion Malleable sales

WILLIAM L. WEARLY
. . . Joy Mfg. Co. executive

(*Continued from page* 120)
managed Pittsburgh and New York offices of the company before becoming Chicago Heights general sales manager in 1933.

♦ ♦ ♦

John M. Price, chairman, Ferro Machine & Foundry Inc., Cleveland, has been appointed chief of the Castings and Forgings Section, Office of Price Stabilization, Washington. Mr. Price has been with Ferro Machine since 1935, serving as president from 1940 until 1950.

♦ ♦ ♦

James A. McGlone has been appointed Chicago direct sales manager for overhead handling systems and E-type cranes, Whiting Corp., Harvey, Ill. His territory includes northern Illinois and northern Indiana. Mr. McGlone was formerly assistant division manager in the home office.

♦ ♦ ♦

James W. Hallock has been appointed sales manager, Albion Malleable Iron Co., Albion, Mich., succeeding the late Jackson D. Waterbury. Mr. Hallock, who joined the sales organization of the company a year and a half ago, was formerly associated with Benton Harbor Malleable Industries, Benton Harbor, Mich., and Mid-West Abrasive Co., Owosso, Mich. Prior to that he was a foundry representative in the Detroit area.

♦ ♦ ♦

William L. Wearly has been elected general sales vice president, Joy Mfg. Co., Pittsburgh, in charge of machinery sales in United States, Canada and Mexico. Mr. Wearly was graduated from Purdue University in 1937, when he joined the company's engineering department and has been successively service manager and vice president of coal machinery sales.

♦ ♦ ♦

Randolph L. Ruhley has been appointed resident sales engineer, the Cleveland Vibrator Co., Cleveland, covering Atlantic coast states from Maine to Maryland, and including New York. Mr. Ruhley, who has been associated with the foundry, blast furnace, steel and metalworking industries, will handle sales of air vibration equipment made by the company.

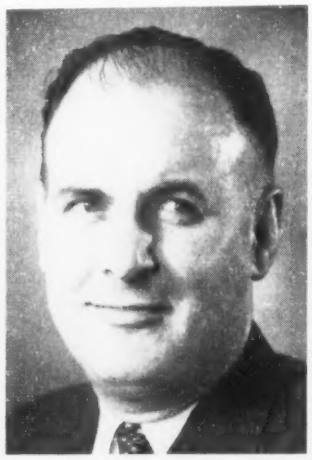
♦ ♦ ♦

J. A. Hill has been appointed manager of industrial sales, **J. F. Corkery,** manager of electric tool sales, and **G. A. Thoma,** sales promotion manager, Independent Pneumatic Tool Co., Aurora, Ill. Mr. Hill, in the company's sales department 26 years, heads the new industrial sales division. He served 20 years in the field and for the past 6 years has been manager of electric tool sales. Mr. Corkery, who joined the company in 1942, has been sales promotion manager for 7 years. Mr. Thoma has had 6 years in the planning, creation and production of the company's sales promotion and advertising programs.

(*Continued on page* 124)

RANDOLPH L. RUHLEY
. . . Cleveland Vibrator sales

J. A. HILL
. . . Independent Tool sales



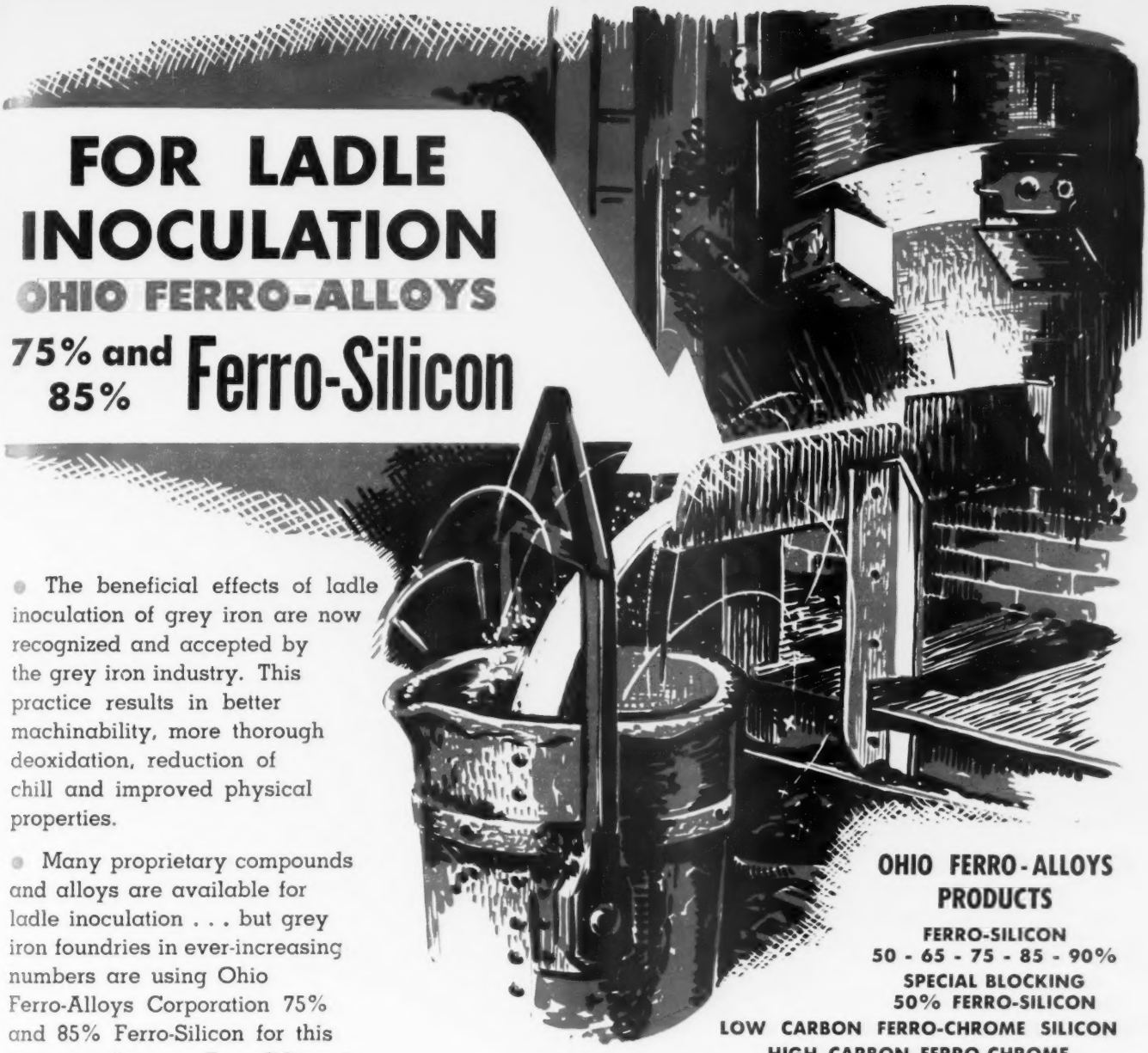
J. F. CORKERY
. . . electric tool sales

G. A. THOMA
. . . sales promotion mgr.

FOR LADLE INOCULATION

OHIO FERRO-ALLOYS

75% and 85% Ferro-Silicon



- The beneficial effects of ladle inoculation of grey iron are now recognized and accepted by the grey iron industry. This practice results in better machinability, more thorough deoxidation, reduction of chill and improved physical properties.

- Many proprietary compounds and alloys are available for ladle inoculation . . . but grey iron foundries in ever-increasing numbers are using Ohio Ferro-Alloys Corporation 75% and 85% Ferro-Silicon for this purpose. Because Ferro-Silicon is both economical and efficient, it will pay you to investigate the use of these general-purpose inoculants in your foundry.

Available in several crushed sizes to suit your requirements . . .

OHIO FERRO-ALLOYS PRODUCTS

FERRO-SILICON
50 - 65 - 75 - 85 - 90%
SPECIAL BLOCKING
50% FERRO-SILICON
LOW CARBON FERRO-CHROME SILICON
HIGH CARBON FERRO-CHROME
FERRO-MANGANESE • BOROSIL • SIMANAL

BRIQUETS
SILICON • MANGANESE • CHROME
SILICO-MANGANESE

PHILO · TACOMA · BRILLIANT

Ohio Ferro-Alloys Corporation
Canton, Ohio

Chicago Detroit Pittsburgh Tacoma Seattle
Minneapolis Birmingham San Francisco Los Angeles

SALES AGENTS AND WAREHOUSES:

SAN FRANCISCO AREA — Pacific Graphite Company, Inc., Oakland 8, California.
LOS ANGELES AREA—Snyder Foundry Supply Company, Los Angeles 11, California.
MINNEAPOLIS AREA — Foundry Supply Company, Minneapolis, Minnesota.
DENVER, COLORADO—Metal Goods Corporation.
CANADA—Overseas Commodities, Ltd., Vancouver, B. C.
MEXICO—CIA. Proveedora de Industrias, S. A. Mexico, 6, D. F., Mexico.

SALES AGENTS, NO WAREHOUSES:

NORTHWEST AREA — E. A. Wilcox Company, Arctic Building, Seattle 4, Washington; Phone Mutual 1468.

BIRMINGHAM DISTRICT—Schuler Equipment Company, First National Building, Birmingham, Alabama.

HAMILTON MIGEL
Magnaflux research

JOHN B. GIRDLER
. . . Vanadium sales, New York

HARRY E. ORR
. . . engineering sales, Vanadium

HORTON J. SCHULTZ
. . . foundry supply sales

(*Continued from page* 122)

Hamilton Migel, second vice president, Magnaflux Corp., has been named director of research and design engineering with headquarters in the Chicago home office. Mr. Migel has been with the company 12 years as manager of the Detroit and Los Angeles offices and more recently eastern manager in New York. **Roy O. Schiebel Jr.,** has succeeded Mr. Migel in New York. During 12 years with the company he has previously managed the West coast and midwest sales offices. **Kermit A. Skeie,** formerly a company field engineer in Illinois, Indiana, Kentucky and Alabama, has been named widwest manager in Chicago.

♦ ♦ ♦

Harry E. Orr has been appointed assistant vice president-manager of engineering sales, Vanadium Corp. of America, New York, with headquarters in Chicago. Mr. Orr has been associated with the company as assistant vice president and manager of district sales. **John B. Girdler** has been named sales manager with headquarters in the New York office. Mr. Girdler, associated with Vanadium Corp. for 17 years, for the past four years has been Pittsburgh regional manager.

♦ ♦ ♦

Horton J. Schultz has joined Ferdinand G. Schultz Co., Pittsburgh, supplier of dust control, foundry and other industrial equipment and materials. Mr. Schultz was formerly assistant sales manager, American Steel Band Co., Pittsburgh.

♦ ♦ ♦

Ransom Cooper Jr. has been appointed manager of the nickel sales department and **H. D. Tietz,** manager of the nickel alloys department, International Nickel Co., New York. Following graduation from Syracuse University in 1912, Mr. Cooper joined Crucible Steel Co., Syracuse, N. Y., and later was associated with American Mond Nickel Co., British subsidiary of Inco, where he became sales manager-vice president. In 1929 he came to International Nickel in New York where he has been assistant sales manager of nickel sales for some time. Mr. Tietz was appointed a company salesman in 1931, became administrative assistant to the sales manager of the nickel alloys department in 1939 and has been assistant to the manager of that department since 1941.

♦ ♦ ♦

James V. Winkler has been named head of the magnesium sales department's technical service and development group, the Dow Chemical Co., Midland, Mich. Mr. Winkler joined the company in 1941 following graduation from University of Michigan, and worked in its magnesium fabricating department in Bay City, Mich,. until 1945 when he was assigned to the magnesium sales group in Los Angeles.

♦ ♦ ♦

Gustav Laub has been elected a director of Vanadium Corp. of America, New York, following retirement after 37 years with the company. Mr. Laub was graduated from University of Pittsburgh in 1915, when he became secretary to Vanadium's chairman of the board. In 1928 he entered sales management and the last 4 years was vice president of sales.

♦ ♦ ♦

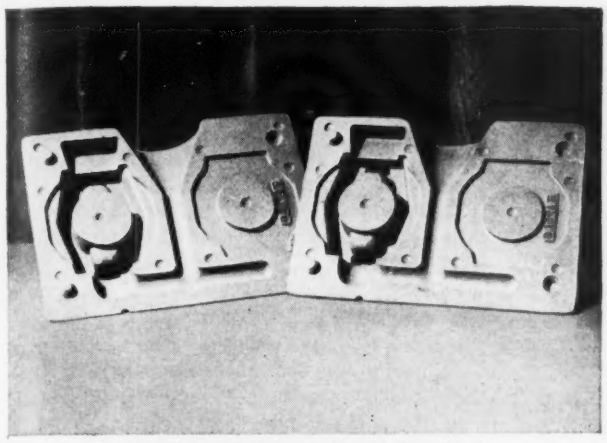
James H. Oakes, formerly sales manager for enclosed drives, Link-Belt Co., Chicago, has been named Philadelphia plant sales manager. **Byron K. Hartman,** previously sales manager in Philadelphia, has been appointed sales manager of the new Colmar plant, north of Philadelphia, which will begin operations later this year. **George A. Most Jr.** has become district manager in Moline, Ill.,

(*Continued on page* 126)

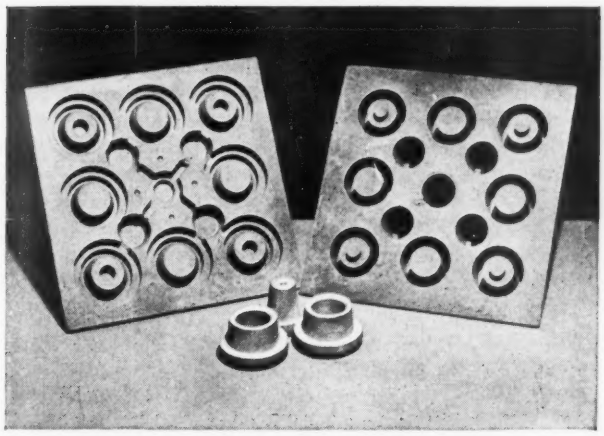
H. D. TIETZ
. . . INCO executive

RANSOM COOPER JR.
. . . nickel sales manager

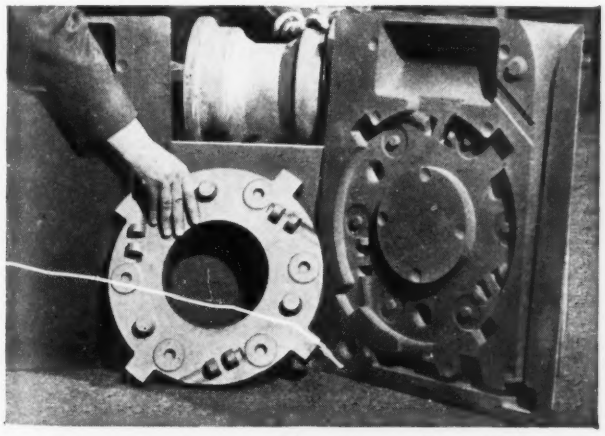
Check these advantages of shell molding



Excellent surface finish of the shell



Castings with dimensional accuracy comparable to precision castings



Large castings possible with excellent finish requiring little or no clean up

Look to Monsanto for the newest developments in shell molding

3 new products are among Monsanto's contributions to the foundry industry

You—like hundreds of other foundrymen—can look *first* to Monsanto for the latest developments, information, and know-how on Shell Molding . . . because Monsanto's search for new, improved products and processes for foundry use is conducted in a well-equipped foundry laboratory.

3 New Research-Built Products

Among several outstanding products developed by Monsanto are two new RESINOX phenolic resins that have been research-built for shell molding: RESINOX 0187A and RESINOX 0188. These two new resins supplement Monsanto's RESINOX 1128 (still the most used resin for shell molding) and Monsanto's phenolic and urea core binder resins.

Another new development from the Monsanto foundry laboratory is RESINOX Dust Suppressant A—which, when added to the resin-sand mixture, eliminates or greatly reduces dusting.

New Booklet On Shell Molding Now Available

Foundrymen, interested in Shell Molding (and resins for core binders), find Monsanto a ready source for the *latest* information and know-how . . . as well as the latest materials. Write for the new booklet which gives latest information on techniques and materials for shell molding. Just mail the handy coupon.

Resinox: Reg. U. S. Pat. Off.

MONSANTO CHEMICALS AND PLASTICS ®

SERVING INDUSTRY...WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY,
Plastics Division, Room 5710, Springfield 2, Mass.

☐ I'd like a copy of your new booklet: "The Shell Molding Process."

☐ Please send information on urea and phenolic core binder resins.

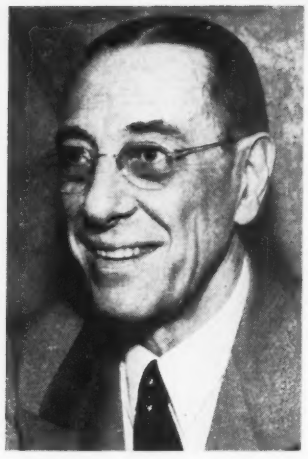
Name & Title _____

Company _____

Address _____

City, Zone, State _____

WILLIAM L. HARTLEY
. . . Link-Belt sales, Chicago



JACK AHRENS
. . . top space salesman

(*Continued from page* 124)
succeeding **Stuart T. Penick,** who has been appointed sales engineer at the Colmar plant.

♦ ♦ ♦

William L. Hartley, formerly Philadelphia sales manager, Link-Belt Co., has been transferred to executive sales headquarters in Chicago where he will specialize in application of long-haulage belt conveyors and other engineering projects. Mr. Hartley, who attended Armour Institute and Northwestern University, joined the Chicago Pershing Road plant in 1915. Following various assignments in Chicago, Kansas City and Detroit, in 1944 he became assistant divisional manager for materials handling machinery in Philadelphia, and sales manager there in 1948.

♦ ♦ ♦

Jack Ahrens, eastern manager of FOUNDRY, was named "Space Salesman of the Year" in the recent fifth annual award of the Industrial Advertising Association of New York, a chapter of the National Industrial Advertisers Association. The award consisted of a handsome gold watch. Jack joined the Penton Publishing Co. and FOUNDRY 35 years ago. He had intended being an architect, but a temporary job with a business paper publisher provided an interest that decided his life work. He joined Penton just prior to entry of the United States in World War I, representing FOUNDRY, *Iron Trade Review* (now *Steel*), and the *Daily Metal Trade* in New England. After a hitch in the Navy, he became Eastern representative of FOUNDRY and has continued to represent this publication there.

♦ ♦ ♦

Robert Cushman has been named Pacific coast district manager, Norton Co., with headquarters in Los Angeles, succeeding **Lucien Gay,** who has retired following 36 years with the company. **Donald F. Jones** has been appointed abrasive engineer in Mr. Cushman's former central New York area. **Kenneth F. Ebbeson,** formerly grinding engineer in the sales engineering department, has been appointed field engineer in the northeastern district. **Harry G. Brutlin** has been transferred to the Pacific coast and **Gordon S. Brandes** has succeeded him in the Rocky Mountain area.

♦ ♦ ♦

Dr. Gilbert E. Doan, since 1939 head of the department of metallurgy, Lehigh University, has been named manager of the metallurgical branch of the research department, Koppers Co., Pittsburgh, effective Aug. 1. A graduate of Lehigh University in 1919, he studied later at University of Berlin. He has been a special consultant in the steel industry for 20 years.

♦ ♦ ♦

Victor L. Persbacker, assistant comptroller and auditor, American Brake Shoe Co., New York, has been elected to membership in the Controllers Institute, an organization of controllers and finance officers from various lines of industry.

♦ ♦ ♦

Arthur R. Lytle has been appointed director of research, **Walter Crafts,** associate director of research, and **David Swan** assistant director of research, Union Carbide & Carbon Research Laboratories Inc. of Union Carbide & Carbon Corp., New York. Mr. Lytle who will move from Niagara Falls N. Y. to New York is a graduate of Rensselaer Polytechnic Institute and has been associated with the Union Carbide laboratories for 29 years. For the past 2 years he has been responsible for metallurgical research activities there. Mr. Crafts, who has degrees from Yale University and Massachusetts Institute of Technology, has been chief metallurgist at the Niagara laboratories since 1946. Mr. Swan, who was graduated from Rensselaer Polytechnic Institute in 1940, joined the Niagara laboratories in 1946.

♦ ♦ ♦

W. Grant Mackenzie, managing director of McKinnon Chain Ltd., Johannesburg, South Africa, an associate company of Columbus McKinnon Chain Corp., Tonawanda, N. Y., recently visited the parent company factories in Tonawanda, Angola, N. Y., and Dixon, Ill., as well as the Canadian associate company, McKinnon Chain Ltd., St. Catharines, Ont. Mr. Mackenzie has been associated with the South African plant since it was organized in 1935.

♦ ♦ ♦

William E. Butts, president, General Metals Corp., San Francisco, has been elected a trustee of the National Security Industrial Association. Mr. Butts has been active in San Francisco regional activities of the association for several years.

♦ ♦ ♦

J. P. McArthur, until recently regional manager of West coast sales, has been named manager of the Philadelphia district sales office, Worthington Corp., Harrison, N. J., succeeding the late W. J. Daly. **H. W. King,** formerly San Francisco district office manager, has become regional manager of West coast sales, and **P. L. McManus,** until recently resident salesman in Portland, Oreg., has succeeded Mr. King in San Francisco.

♦ ♦ ♦

Richard K. Morse and **John J. Clems** recently joined the magnesium sales group of Dow Chemical Co., Midland, Mich. Mr. Morse, a graduate of Yale University, has been assigned to the St. Louis sales office, and Mr. Clemens, who was graduated from Rice University, will be in the Houston, Tex., office.

♦ ♦ ♦

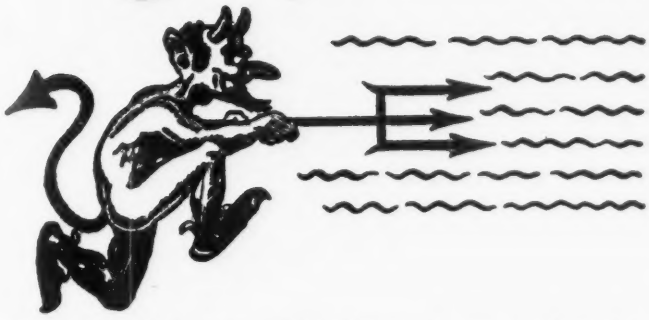
E. Stephen Farlow has been appointed manager of an office which Sterling Electric Motors Inc., Los Angeles, recently opened in Baltimore, at 1658 Roundhill Rd. Mr. Farlow was graduated from University of Maryland and has a background of experience in the electrical field. He will be under administrative direction of **William L. Pharmer,** Philadelphia district manager.

♦ ♦ ♦

George W. Horton, executive vice president, Wilmington Casting Co., Wilmington, O., has been appointed

(*Concluded on page* 128)

Soffel's EXOTHERMIC (Patented) COMPOUNDS and FLUXES for all Metals and Alloys



THERMOTOMIC "X" COMPOUND is an exothermic material which is molded and baked into necked down riser cores and inserts. It produces a temperature of 3500° F. and is used as ring inserts under the risers or feeding heads. Great savings are realized through reduced riser dimensions and cleaning costs.

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER—Feeding head compound for castings and ingots of ferrous and non-ferrous metals—saves metal and prevents piping.

THERMOTOMIC ABC—For aluminum and magnesium, necked down riser cores and inserts—prevents piping into castings.

CARBON FREE LIQUIDIZER AL-X31—For aluminum and magnesium feeding heads—prevents piping.

THERMOTOMIC HoTop—For short riser heads—save 60 to 70% of your feeding metal in the heads.

EXOTHERMIC INSULATING SLEEVE CORE COMPOUND—For riser sleeves—adds heat and prolongs fluidity of feeding metal in heads or risers.

DENSILTITE LADLE FLUX—For iron and semi-steel—reduces sulfur and phosphorous. Adds fluidity and temperature in pouring ladles—produces close grain iron.

THERMO CUPOLA FLUX—For iron and semi-steel—saves coke, produces cleaner, hotter iron and faster melting.

Soffel's Non-Ferrous Fluxes

BB-2 BRASS FLUX—For pressure castings—removes sulfur, iron, phosphorous oxides and gas from brass and bronze.

SUPER BRASS FLUX—Prevents oxidation—a cover flux for yellow brass and bronze.

BRASS REFINING FLUX—For cupola melting and open flame furnaces—prevents oxidation. Produces liquid slag and faster melting.

COVERALL BRASS FLUX—Removes gas and oxides from yellow brass and nickel silver.

RADIOCLARITE BRASS FLUX—For open flame furnace melting—increases fluidity, tensile strength, removes gas, oxides and iron.

AB-6 BRASS FLUX—For electric furnace melting of brass and aluminum bronze—keeps furnace linings clean.

KLEEN-ALL BRASS CLEANER—Absorbs liquid slag and oxides from the metal—keeps ladles and furnace linings clean.

BRASS ALUMINUM REMOVER—Removes all traces of aluminum from copper, brass or bronze.

HI-LED BRONZE FLUX—Holds lead up to 50% in copper without use of nickel.

NICKEL MONEL FLUX—Removes gas and adds fluidity to metal.

ALUMINUM BRONZE FLUX—A perfect deoxidizer for reducing aluminum and iron oxide in manganese bronze and aluminum bronze. Adds fluidity.

COPPERTITE FLUX—For high conductivity casting—removes cuprous and cupric oxides and gas from copper.

FERRO-OUT IRON REMOVER—Removes free iron or alloyed iron from brass, bronze or copper.

SOFFELITE ALUMINUM FLUX—Removes aluminum oxide and iron from aluminum and increases the fluidity and tensile strength.

MAGNALUM FLUX—For magnesium and aluminum alloys—removes gas and oxide and increases fluidity.

KLEN ZINC FLUX—A deoxidizer and purifier for zinc base pressure castings—removes gas, sulfur and iron.

DIE COATING—For pressure zinc base die castings—will not scale, blister or create gas in the molds.

PERMANENT MOLD COATING—For aluminum and magnesium castings—adds longer life to molds. Produces clean gas free castings.

POT COATING—For iron pot melting—increases life of pots. Prevents iron pick up.

BEWARE OF IMITATIONS: We are the originators of Exothermic Carbon Free Liquidizer and Patented Thermotomic Compounds.

Pittsburgh Metals Purifying Company

Manufacturers of Quality Fluxes and Purifiers for All Metals and Alloys

1352 Marvista St., N. S. Pittsburgh 12, Pa.

(*Concluded from page* 126)
to the industrial advisory committee, National Arts Foundation, New York, an organization to encourage creation, interpretation and appreciation of the arts in this country.

♦ ♦ ♦

Thomas D. Cartledge has been appointed president, Linde Air Products Co., division of Union Carbide & Carbon Corp., New York. Mr. Cartledge attended Erskine College and joined Linde sales organization following World War I. In 1925 he was sent to the general sales management staff in New York, became vice president in 1940 and senior vice president in 1944.

♦ ♦ ♦

Fred J. Ebeling has been appointed general sales manager, Dodge Mfg. Corp., Mishawaka, Ind. Mr. Ebeling, who attended University of Indiana, joined the company as credit manager in 1943, later becoming secretary-treasurer.

♦ ♦ ♦

William J. Grede, president of Grede Foundries Inc., Milwaukee, was recently named national president of the YMCA. He had previously served in local and state offices and as a member of its national board.

FEF TRUSTEES HOLD ANNUAL MEETING

FOUNDRY Educational Foundation announced at the annual meeting of trustees, held in Atlantic City, May 5, that the following officers had been elected: John M. Price, Ferro Machine & Foundry Inc., Cleveland, chairman of the board; M. J. Allen, American Steel Foundries, Chicago, president; J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, vice president; C. A. Barnett, Foundry Equipment Co., Cleveland, secretary-treasurer; George K. Dreher, executive director.

Trustees representing founding members are as follows: Malleable Founders' Society, Frank D. Brisse, Laconia Malleable Iron Co., Laconia, N. H.; and Cal C. Chambers, Texas Malleable Iron Co., Lufkin, Tex.; Gray Iron Founders' Society, Thomas I. Curtin Jr., Waltham Foundry Co., Waltham, Mass., and W. R. Tanner, Zenith Foundry Co., West Allis, Wis.; American Foundrymen's Society, I. R. Wagner, Electric Steel Castings Co., Indianapolis, and Fred J. Walls, International Nickel Co., Detroit; Foundry Equipment Manufacturers' Association, Thomas Kaveny Jr., Herman Pneumatic Machine Co., Pittsburgh; and Charles A. Barnett, Foundry Equipment Co., Cleveland; Non-Ferrous Founders' Society, H. A. White, Smeeth-Harwood Co., Chicago; and Thomas B. Beifield, Cochrane Foundry Co., York, Pa.; Steel Founders' Society of America, M. J. Allen, American Steel Foundries, Chicago; and Homer Tielke, Crucible Steel Castings Co., Cleveland.

Trustees at large, serving one year, are: R. L. Gilmore, Superior Steel & Malleable Castings Co., Benton Harbor, Mich.; C. B. Schneible, Claude B. Schneible Co., Detroit; John M. Price, Ferro Machine & Foundry Inc., Cleveland; Allen M. Slichter, Pelton Steel Castings Co., Milwaukee. Serving two years: J. H. Smith, Central Foundry Division, General Motors Corp., Saginaw, Mich.; Claude Jeter, Foundry Division, Ford Motor Co., Cleveland; Anthony Haswell, Dayton Malleable Iron Co., Dayton, O.; John A. Wagner, Wagner Malleable Iron Co., Decatur, Ill. Serving three years: J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham; E. C. Hoenicke, Foundry Division, Eaton Mfg. Co., Detroit; Leon J. Wise, Chicago Malleable Castings Co., Chicago; R. P. Brewer Symington-Gould Corp., Depew, N. Y.

Retiring President John M. Price, reporting at the annual trustees meeting, outlined the progress which has been made by the foundation. He stated that while much progress has been made by the foundation in the growth of foundry courses, in the enlargement and refinement of the foundry teaching staffs of the various universities and the spreading of influence among students, the most concrete symbol of progress lies in the advances in foundry laboratory facilities. With the funds being spent during the current year, the 14 universities will have added well over $1 million worth of foundry laboratory facilities to which the foundation contributed about $80,000. Mr. Price also commented on the development of textbooks at the engineering level dealing with foundry practice.

While reports now beginning to come to the foundation indicate the value to individual foundries of the boys coming out of this program, Mr. Price stated that the foundry industry needs more development in the training and use of engineering talent. He pointed out that this is understandable since foundries are attempting to do in a few years a job which some other industries required 20 to 50 years to accomplish. Another development of the foundation has been progress in influencing students as prospective future customers in the value of cast products. While emphasis of the program may change, Mr. Price believes that these objectives should be continued for many years to come.

JOHN M. PRICE
Board Chairman

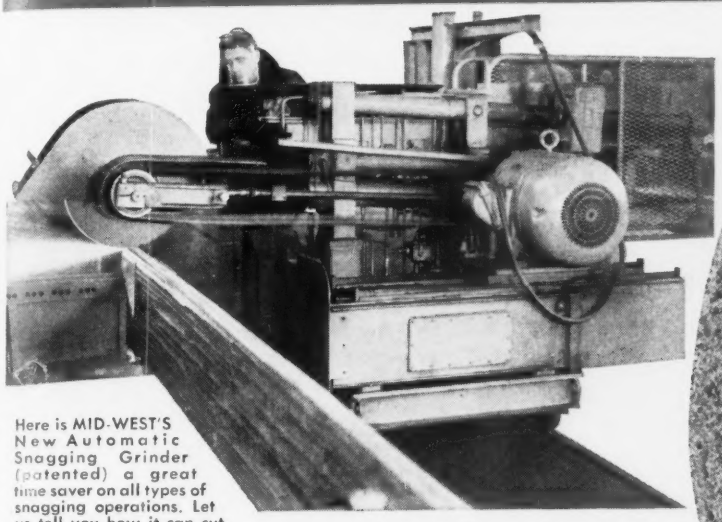
MARION J. ALLEN
President

GEORGE K. DREHER
Executive Director

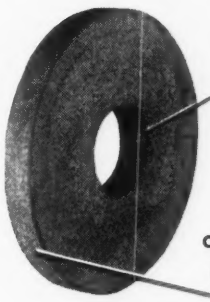
JAMES T. MacKENZIE
Vice President

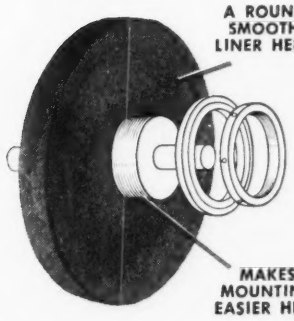
CHARLES A. BARNETT
Secretary-treasurer

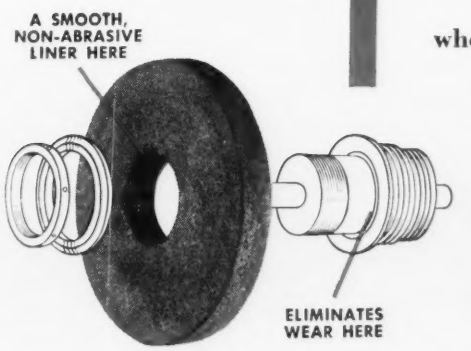
GREATER PRODUCTION . . .



Here is MID-WEST'S New Automatic Snagging Grinder (patented) a great time saver on all types of snagging operations. Let us tell you how it can cut costs on your grinding jobs.







. . . that's what you get when you use MID-WEST'S Fiber-Cushioned Snagging Wheels.

. . . and here are the reasons why they are better "on the job" wheels.

- **easier to mount.**
- **easier on your operator.**
- **easier on your spindle and bearings.**
- **easier on your work piece.**

Not only will Mid-West Fiber-Cushioned resinoid snagging wheels minimize the troubles so characteristic of snagging operations, but they're easier to mount, they're stronger, and they last longer.

The fiber-cushioned centers plus Mid-West's special resinoid bond, an extremely cool cutting bond, assures a highly satisfactory wheel life and increased production.

For complete information on these Fiber-Cushioned snagging wheels, write, wire or phone today.

MID-WEST ABRASIVES

Executive Offices: 510 South Washington Street, Owosso, Michigan
Plants in Owosso, Michigan and Rochester, Pennsylvania

Industry BRIEFS

CARBORUNDUM METALS CO., a new subsidiary of Carborundum Co., Niagara Falls, N. Y., has contracted with Atomic Energy Commission for the production of zirconium and hafnium metal. New company will design, build, and operate its own production facility at a location not yet announced. Niles C. Bartholomew is vice president of Carborundum Metals and will direct its organization and operation.

* * *

Vonnegut Moulder Corp., Indianapolis, because of the retirement of Anton Vonnegut, has been taken over by its present personnel and will be known as the Grinding & Polishing Machinery Corp. Officers of the newly formed corporation are R. W. Smart, president; O. S. DeHaven, vice president, and I. W. Bosworth, secretary-treasurer. Mr. Vonnegut will continue as a member of the board of directors. No change in operations is contemplated.

* * *

Hoyne Iron & Steel Co., 330 North California Ave., and Chicago Metals Co., Chicago, scrap dealers, have consolidated with headquarters at the Hoyne company office. A warehouse for nonferrous scrap operations of Chicago Metals will be constructed on land adjoining the Hoyne property. The consolidation, which will not affect company names for the present, is scheduled for completion by Sept. 1.

* * *

H. K. Ferguson Co., 1783 East Eleventh St., Cleveland, industrial engineers and builder, has purchased all process and patent rights covering the Elliott oxygen system for production of tonnage oxygen and high purity nitrogen. It will offer complete plants of this type on a turn-key contract basis.

* * *

Cleco Division, Reed Roller Bit Co., Houston, Tex., has appointed the following distributors: Chas. H. Harden & Co., 2221 Fourth Ave. South, Seattle 4; Highway Equipment & Supply Co., 21st and N Sts., Lincoln, Nebr.; Long Beach Welders' Supply Co., Long Beach 13, Calif., and E. W. Harman Co., 819 West Fifth Ave., Columbus 8, O.

* * *

Colonial Aluminum Smelting Corp., Columbia, Pa., is operating its new secondary aluminum smelter for production of secondary aluminum ingots. Sales and purchasing for the company are handled by Colonial Metals Co., Columbia, which also will handle these functions for Colonial Smelting & Refining Co., smelter of brass, bronze, lead, babbit, and solder.

* * *

Chain Belt Co. has moved its executive headquarters from 1600 West Bruce St., to its new administration building at 4701 West Greenfield Ave., Milwaukee. New building of brick, stainless steel and glass is adjacent to the company's manufacturing facilities, and houses departments of general and field sales administration, sales promotion, purchasing, etc.

* * *

Babcock & Wilcox Co., New York 17, has moved its general office and New York district sales offices of the Boiler and Refractories Divisions to 161 East 42nd St. The New York district sales office of Tubular Products Division remains at 22 East 40th St.

* * *

C. W. Shumway & Sons, 365 Island Ave., Batavia, Ill., gray iron foundry, marks its 80th anniversary this year. Specializing in machinery castings, the company was founded in 1872 by Charles W. Shumway.

* * *

Niles Aluminum Casting Co., Box 349, Niles, O., has added facilities for machining, patternmaking, buffing and plating.

* * *

Speer Carbon Co., Saint Marys, Pa., and its subsidiaries, Jeffers Electronics Inc., DuBois, Pa.; International Graphite & Electrode Corp., Niagara Falls, N. Y., and Speer Resistor Corp., Saint Marys, have consolidated into one company, the Speer Carbon Co. The subsidiaries henceforth will operate as divisions of Speer.

* * *

Taccone Pneumatic Foundry Equipment Co., North East, Pa., has purchased Arcade Molding Machine Co., Freeport, Ill. Operations for the present will continue at Freeport without change until completion of a plant expansion program at North East at which time the Arcade plant will be moved.

* * *

Superb Light Alloys Inc. was incorporated in New York Apr. 24 to operate a foundry business and deal in metals and metal alloys. Directors are: John Hickey Jr. and Mildred E. Hickey, 33 Horn Lane, Levittown, L. I., N. Y. and Marie Hendrickson, 100 Marion Ave., Belmore, Long Island.

* * *

Standard-Thomson Co., 216 South Main St., Dayton, O., has purchased Centrifugal Investment Casting Co., 246 South Front St., Burbank, Calif. The Burbank plant will retain its present management and will operate as a subsidiary of Standard-Thomson.

* * *

Fred K. Brown Co., 934 Brown-Marx Bldg., Birmingham, has been formed as a foundry consultant firm and dealer in coal, coke, and pig iron. Mr. Brown had been sales manager of Adams, Rowe & Norman Inc., Birmingham.

* * *

Howard Foundry Co., Chicago, has purchased the investment castings division of Allis-Chalmers Mfg. Co. at 1347 South 65th St., Milwaukee, and will continue its operation. K. J. Yonker is plant manager.

* * *

Automatic Foundry Equipment, Reichert Inc., Newark, N. J., has appointed M. F. Becker & Associates, 122 South Michigan Ave., Chicago 3, as representatives in that area.

* * *

Valley Foundry Inc., P.O. Box 54, Hot Springs, Ark., was incorporated Apr. 24 in Arkansas by Samuel A. Long, O. J. Samples, and Peter H. Van Saul.

* * *

Meloon Bronze Foundry Inc., formerly located at 207 Sunset Ave., Syracuse 8, N. Y., has moved to 1841 LeMoyne Ave., Syracuse.

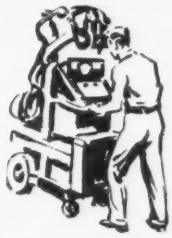
* * *

Michigan Oven Co., Detroit, has moved its offices to the Architects Building, 415 Brainard St.

5 TO 50 KV INSPECTION UNIT

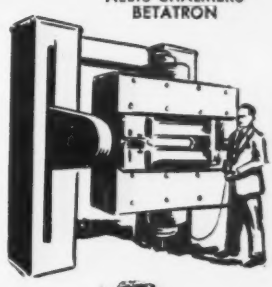
X-RAY DIFFRACTION UNIT

150 KV MOBILE X-RAY UNIT



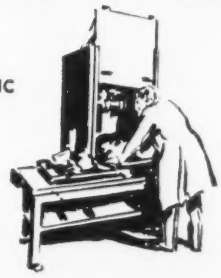
260 KV X-RAY UNIT

22,000,000 VOLT ALLIS-CHALMERS BETATRON



if it has to do

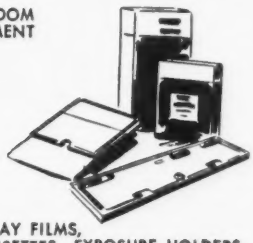
RAYPROOF RADIOGRAPHIC CABINET



RAYPROOF X-RAY INSPECTION CABINET

with X-RAY

DARKROOM EQUIPMENT



X-RAY FILMS, CASSETTES, EXPOSURE HOLDERS

CHEMICALS, ACCESSORIES, SUNDRIES

LAYOUT PLANNING

MAINTENANCE SERVICE

it has to do with

Picker x-ray

Picker *specializes* in x-ray, and x-ray only, covering the field like a blanket. *Whatever you need, we've got* . . . from a simple lead letter to a 22,000,000 volt betatron. To serve you, there are sales offices and service depots in all principal cities, staffed by skilled engineers prepared to cope with any x-ray problem promptly and with understanding. If you are now using x-ray, or are wondering whether you should, you can depend on Picker for objective technical counsel and efficient handling.

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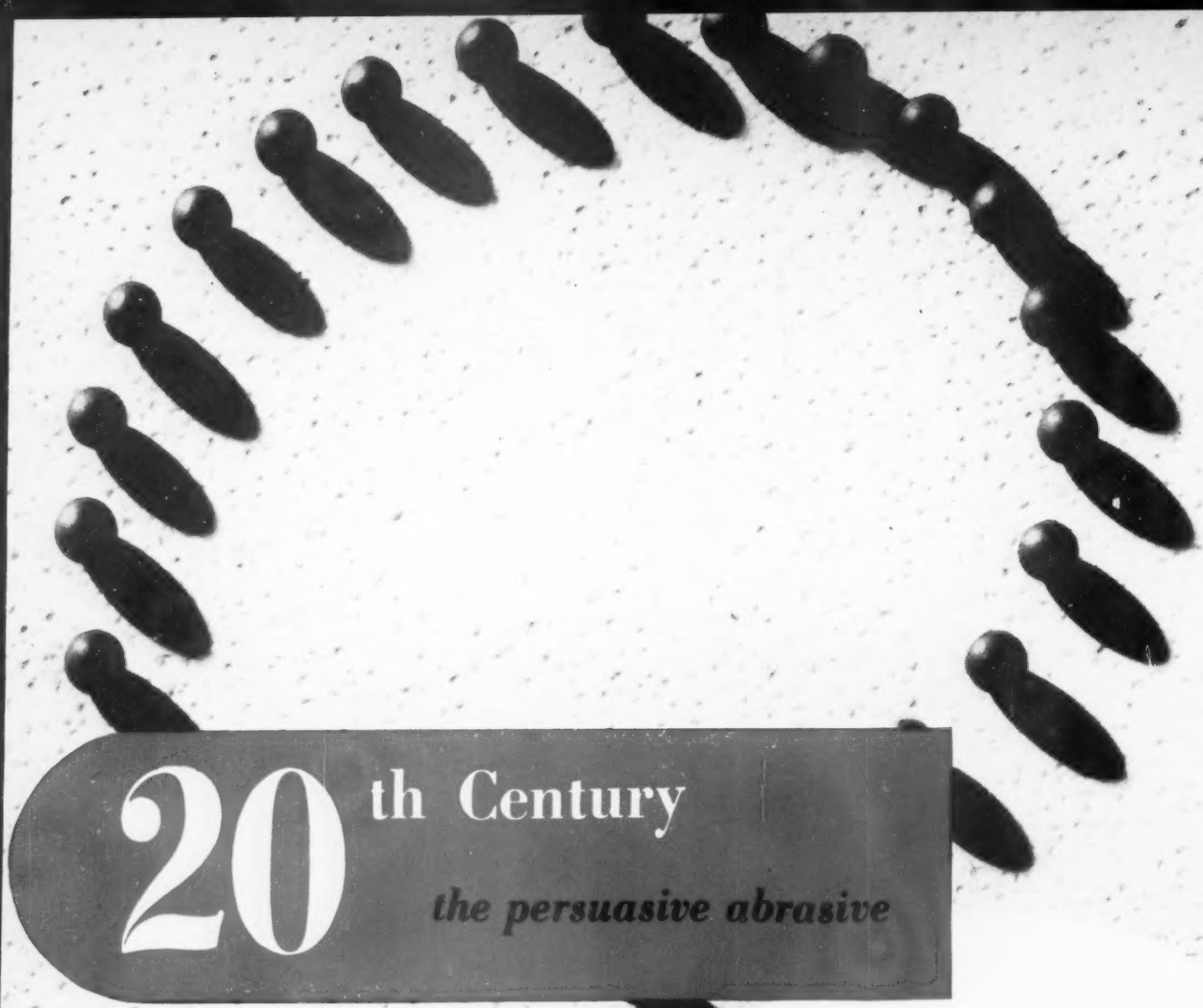

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the persuasive abrasive

If it's a question of uniformity, toughness, or economy in abrasives, use 20th Century *Normalized, our malleable shot and grit.

Normalized is providing a ready answer to all three questions in foundries and metal working plants everywhere.

Normalized wears 3 times longer than conventional shot.

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THE CLEVELAND Metal Abrasive CO.

800 East 67th Street Cleveland 8, Ohio
Howell Works: Howell, Michigan

One of the world's largest producers of quality shot, grit and powder—Normalized —Hard Iron—Cut Wire.

Foundry STATISTICS

Malleable Iron

(Shipments of castings—net tons[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1950	920,502	512,192	.....
1951			
Mar.	102,173	60,771	270,091
3 mo.	283,631	170,503	.....
Apr.	97,276	57,554	276,463
May	100,800	61,373	274,954
June	94,376	57,176	258,144
July	76,826	45,072	263,017
Aug.	90,727	57,164	249,273
Sept.	82,276	48,568	244,575
Oct.	93,884	58,251	238,019
Nov.	88,210	53,682	220,740
Dec.	76,045	45,543	215,134
Total	1,083,545	654,380	.....
1952			
Jan.	87,003	54,988	202,799
Feb.	82,898	50,129	193,061
Mar.	80,960	49,084	196,896
3 mo.	250,861	154,201	.....

Aluminum

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Sand	Perm. Mold	Die	Unfilled Orders[3]
1950	543,082	184,782	181,366	167,201	.....
1951					
Mar.	42,204	15,900	12,771	12,677	100,453
3 mo.	144,874	51,090	48,557	42,673	.....
Apr.	40,242	14,455	12,901	12,079	106,077
May	40,487	14,798	13,400	11,692	112,638
June	35,961	13,853	10,323	10,850	112,760
July	27,426	10,739	7,142	8,693	119,461
Aug.	35,531	14,128	10,922	9,526	117,888
Sept.	32,487	13,086	8,829	9,730	122,973
Oct.	35,222	13,950	10,131	10,297	110,382
Nov.	32,367	12,728	8,816	9,926	116,044
Dec.	30,799	12,587	8,387	8,441	112,479
Total	436,049	164,731	131,258	129,404	.....
1952					
Jan.	46,424	18,051	12,236	13,884	109,654
Feb.	44,847	17,451	13,445	13,012	110,327
Mar.	47,233	19,288	13,754	12,880	106,776
3 mo.	138,504	54,790	39,435	39,776	.....

Copper-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Sand	Perm. Mold	Unfilled Orders[3]
1950	1,056,973	953,590	55,614	.....
1951				
Mar.	110,887	100,221	6,405	79,766
3 mo.	318,405	286,561	18,885	.....
Apr.	101,506	91,852	5,802	82,711
May	105,438	95,049	5,986	84,002
June	98,559	88,818	5,358	83,518
July	76,551	69,334	4,064	85,837
Aug.	94,443	84,720	5,097	84,821
Sept.	85,433	76,304	5,161	84,611
Oct.	94,706	84,544	5,845	82,491
Nov.	87,764	78,640	5,661	82,667
Dec.	76,526	69,653	4,639	80,435
Total	1,131,402	1,018,973	65,808	.....
1952				
Jan.	89,616	80,376	6,233	78,316
Feb.	86,231	77,813	5,204	75,279
Mar.	88,840	79,521	6,182	74,903
3 mo.	264,687	237,710	17,619	.....

Magnesium

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[3]
1950	15,224	13,310	.....
1951			
Mar.	2,156	2,058	12,196
3 mo.	7,438	6,564	.....
Apr.	2,267	2,161	12,191
May	2,334	2,206	12,867
June	1,758	1,642	14,331
July	1,676	1,557	15,528
Aug.	2,270	2,135	16,095
Sept.	2,010	1,931	16,407
Oct.	2,371	2,300	16,143
Nov.	2,774	2,461	15,550
Dec.	2,220	2,098	14,729
Total	25,583	24,089	.....
1952			
Jan.	3,569	3,083	14,047
Feb.	3,368	2,940	14,459
Mar.	3,504	2,972	13,279
3 mo.	10,441	8,995	.....

Foundry Production Workers

Estimated Number	Mar. 1952	Feb. 1952	Mar. 1951
Gray Iron	.....	148,200	163,300
Malleable	.....	26,400	27,500
Steel	.....	66,500	59,800
Nonferrous	.....	92,900	93,400
Average Weekly Earnings			
Gray Iron	$69.75	$68.62	$72.17
Malleable Iron	68.87	70.15	73.40
Steel	75.73	76.58	74.61
Nonferrous	77.96	77.83	73.12
Average Weekly Hours			
Gray Iron	40.6	40.2	43.4
Malleable Iron	38.8	39.7	43.1
Steel	42.0	42.9	43.1
Nonferrous	42.3	42.3	42.0

Labor Turnover Rate (Feb.)

(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	3.0	4.2	2.0	1.4
Malleable Iron	3.3	4.9	2.4	1.7
Steel	4.6	4.4	3.0	0.4
Nonferrous	5.0	5.0	1.9	1.5

Source: Bureau of Labor Statistics

Gray Iron Castings—Shipments

(Net tons[1])

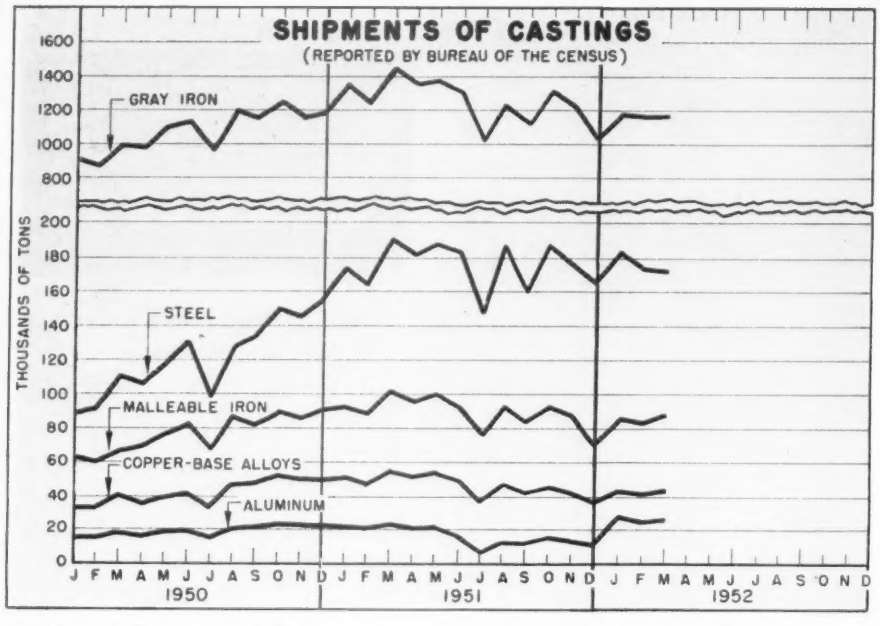
	All Castings—Total	All Castings—For Sale	Miscellaneous Castings—Total	Miscellaneous Castings—For Sale	Heavy Steel Ingot Molds—Total	Heavy Steel Ingot Molds—For Sale	Chilled Railroad Car Wheels—Total	Chilled Railroad Car Wheels—For Sale	Pressure Pipe & Fittings Total[2]	Soil Pipe & Fittings Total[2]	Unfilled Orders[3] Total
1950	12,905,562	6,880,352	8,117,748	3,415,281	2,308,661	1,043,590	514,074	456,402	1,203,762	761,317	.....
1951											
Mar.	1,440,409	818,426	921,980	428,033	231,853	114,858	68,282	57,241	143,702	74,592	2,389,911
3 mo.	4,038,946	2,265,761	2,609,141	1,203,828	654,325	309,931	173,751	150,273	392,622	209,107	.....
Apr.	1,363,041	766,735	880,381	403,619	217,970	106,417	61,993	54,002	134,302	68,395	2,336,926
May	1,396,236	796,053	897,913	418,950	225,129	112,145	65,721	57,485	139,854	67,619	2,228,596
June	1,308,987	742,794	847,024	395,329	216,620	108,042	58,620	52,700	121,851	64,872	2,162,152
July	1,028,812	568,126	653,656	301,749	200,764	97,575	40,792	35,202	88,217	45,383	2,208,116
Aug.	1,218,832	697,952	779,838	378,042	222,721	109,257	50,127	44,507	115,284	50,862	2,144,587
Sept.	1,114,789	625,511	704,657	328,331	204,856	96,011	45,467	41,360	111,893	47,916	2,055,392
Oct.	1,301,681	732,764	815,815	382,405	244,556	115,738	53,172	46,483	130,636	57,502	1,983,307
Nov.	1,183,833	674,139	737,971	348,991	222,665	107,569	48,759	43,141	129,766	44,672	1,933,972
Dec.	1,032,799	582,614	646,352	309,696	204,911	94,857	41,594	38,119	108,767	31,175	1,847,065
Total	14,987,696	8,449,515	9,571,570	4,469,069	2,624,517	1,257,542	633,996	563,272	1,474,110	699,000	.....
1952											
Jan.	1,199,285	694,498	745,548	359,806	225,704	110,263	57,155	53,551	125,729	45,149	1,800,905
Feb.	1,155,143	654,833	733,067	348,885	219,251	105,918	50,444	47,649	107,669	44,712	1,766,434
Mar.	1,172,017	660,920	723,225	334,492	228,799	110,607	53,919	49,747	115,843	50,231	1,711,037
3 mo.	3,526,445	2,010,251	2,201,840	1,143,183	683,754	326,788	161,518	150,947	349,241	150,092	.....

Steel Castings—Shipments

(Net tons[1])

	All Castings—Total	All Castings—For Sale	All Castings—Railway Specialties	Carbon Steel—Total	Carbon Steel—For Sale	Carbon Steel—Railway Specialties	Alloy Steel—Total	Alloy Steel—For Sale	Alloy Steel—Railway Specialties	Unfilled Orders[3] Total
1950	1,459,382	1,042,884	261,357	1,081,162	788,619	243,215	379,220	254,265	18,142	.....
1951										
Mar.	182,765	134,184	43,996	142,132	106,745	39,452	40,633	26,439	4,444	779,717
3 mo.	520,797	375,342	129,366	403,521	298,403	114,035	117,286	75,939	15,231	.....
Apr.	181,908	129,059	41,545	139,948	102,367	37,553	41,960	26,692	3,992	846,947
May	189,232	131,102	39,845	143,201	101,363	35,511	46,031	29,739	4,334	881,702
June	184,424	131,219	42,337	141,538	103,090	38,200	42,886	28,129	4,137	895,054
July	147,251	100,141	27,585	111,964	78,034	24,516	35,287	22,107	3,069	929,978
Aug.	177,096	128,981	41,763	130,913	99,732	36,086	46,183	29,249	5,677	944,211
Sept.	160,695	116,658	35,500	120,632	89,771	33,086	40,063	26,887	2,414	918,038
Oct.	189,929	139,953	39,984	138,610	104,449	36,488	51,319	35,504	3,496	891,508
Nov.	176,728	131,276	35,034	126,544	95,180	31,099	50,184	36,096	3,935	865,029
Dec.	165,110	123,448	33,213	119,762	89,298	29,341	45,348	34,150	3,872	846,436
Total	2,100,970	1,507,179	476,372	1,583,375	1,162,687	415,955	527,695	344,492	50,457	.....
1952										
Jan.	183,738	139,488	37,091	133,985	102,265	31,806	49,753	37,223	5,285	869,299
Feb.	174,626	133,602	31,719	125,484	94,969	28,251	49,142	38,633	3,468	856,872
Mar.	173,694	131,997	32,118	125,787	95,206	27,782	47,907	37,196	4,336	857,115
3 mo.	532,058	405,087	100,928	385,256	292,540	87,839	146,802	113,052	13,089	.....

[1] Source: Bureau of the Census. [2] All cast iron pipe is shipped for sale. [3] For sale only.



Index of Foundry Equipment Orders

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1951	1952
Jan.	668.0	404.5
Feb.	638.6	200.4
Mar.	599.0	310.0
Apr.	490.1	385.1
May	431.7	....
June	393.2	....
July	390.3	....
Aug.	404.5	....
Sept.	346.5	....
Oct.	372.4	....
Nov.	305.5	....
Dec.	230.5	....

Note: Figures are percentages of the base period 1937-1939 taken as 100 per cent (monthly average). Source: Foundry Equipment Manufacturers Association.

Coke Production and Consumption

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1950	72,718,038	73,373,618	3,523,396
1951			
Apr.	6,471,316	6,335,793	357,018
4 mo.	25,973,898	25,875,316	1,282,645
May	6,730,122	6,716,780	367,946
June	6,567,640	6,638,043	324,758
July	6,629,863	6,495,585	301,447
Aug.	6,768,161	6,674,495	299,027
Sept.	6,470,658	6,366,969	274,017
Oct.	6,742,767	6,727,211	292,737
Nov.	6,501,098	6,562,279	272,338
Dec.	6,738,759	6,821,446	249,490
Total	79,122,966	78,868,124	3,664,404
1952			
Jan.	6,804,106	6,760,011	261,148
Feb.	6,358,715	6,411,905	251,125
Mar.	6,779,639	6,743,944	264,488
Apr.	5,809,451	5,775,781	264,384
4 mo.	25,751,911	25,691,641	1,041,145

Ingot Brass and Bronze

(Shipments in net tons)

	1951	1952
Jan.	28,416	28,315
Feb.	27,168	24,211
March	31,997	23,890
Apr.	30,472	22,547
May	33,267	.....
June	33,817	.....
July	32,016	.....
Aug.	25,285	.....
Sept.	22,285	.....
Oct.	23,124	.....
Total for year	332,378	.....

Zinc-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1950	579,332	376,681	.....
1951			
Mar.	44,218	27,959	100,652
3 mo.	135,844	90,322	.....
Apr.	43,513	28,565	101,949
Total, 1951	450,375	291,796	.....
1952			
Jan.	38,027	24,974	70,262
Feb.	34,307	23,006	70,034
Mar.	35,042	23,443	67,846
3 mo.	107,376	71,423	.....

Pig Iron Production and Consumption

	Production** (Standard grades—1000 net tons) Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace, 1000 gross tons) Total	Cupola	Air	Electric
1950	64,589.1	2,870.4	3,034.2	50,450.5	8,234.0	58,416	5,475	319	326
1951									
Mar.	5,919.3	267.9	276.5	4,647.5	727.5	5,406	550	33	15
3 mo.	16,805.8	806.6	735.8	13,184.5	2,079.0	15,498	1,584	94	36
Apr.	5,812.2	259.1	261.0	4,575.8	716.1	5,281	516	31	11
May	6,104.9	282.0	259.4	4,777.0	786.5	5,522	533	31	11
June	5,911.3	254.2	276.5	4,631.9	748.7	5,348	486	30	11
July	5,994.8	280.4	250.0	4,702.8	761.6	5,317	378	23	10
Aug.	5,988.6	252.7	254.4	4,723.3	758.2	5,358	465	30	11
Sept.	5,811.6	257.7	243.7	4,576.8	733.4	5,266	431	27	12
Oct.	6,112.6	260.6	299.4	4,777.4	775.2	5,601	489	31	14
Nov.	5,824.5	285.5	269.0	4,532.1	737.9	5,287	448	29	9
Dec.	5,898.1	247.4	257.5	4,653.0	740.2	5,282	401	28	11
Total	70,264.5	3,186.2	3,169.0	55,134.1	8,774.8	63,760	5,731	354	136
1952									
Jan.	5,964.3	233.1	285.8	4,672.3	773.1	5,452	466	29	14
Feb.	5,701.8	245.2	261.4	4,496.9	698.3	5,139	441	29	11
Mar.	6,226.2	250.3	273.1	4,895.9	806.9	....	...	...	...
3 mo.	17,892.3	728.6	820.3	14,065.1	2,278.3				

* Source: U. S. Dept. of Interior, Bureau of Mines. ** Source: American Iron & Steel Institute. [1] Source: Bureau of the Census. [2] For sale only.

Iron and Steel Scrap Consumption

(Gross tons*)

	All Scrap—Total	All Scrap—Purchased	By Types of Furnace: Cupola—Total	Cupola—Purchased	Air—Total	Air—Purchased	Electric—Total	Electric—Purchased
1950	61,497,000	29,403,000	9,474,000	4,666,000	1,118,000	407,000	6,385,000	3,828,000
1951								
Feb.	5,337,562	2,691,692	936,918	492,395	101,233	38,135	627,308	398,814
2 mo.	11,312,944	5,701,992	1,946,060	1,026,100	211,237	79,251	1,311,792	834,447
Mar.	6,187,520	3,100,622	1,064,325	558,833	108,513	39,260	728,786	463,371
Apr.	5,987,947	3,013,527	1,029,069	545,897	103,458	37,973	704,416	457,521
May	6,096,678	3,087,313	1,063,281	568,198	111,914	39,312	734,483	484,878
June	5,693,402	2,847,856	972,949	517,604	108,740	39,454	693,636	462,092
July	5,298,644	2,581,856	747,864	393,254	80,903	29,858	632,782	421,689
Aug.	5,614,535	2,721,287	918,180	487,085	104,809	37,592	720,020	475,190
Sept.	5,377,491	2,585,665	811,332	427,035	93,166	33,640	688,941	460,446
Oct.	5,869,590	2,826,221	951,406	504,804	102,950	38,534	750,915	489,217
Nov.	5,596,368	2,699,556	847,991	451,591	90,302	33,795	738,589	489,999
Dec.	5,483,089	2,656,536	738,150	398,538	87,748	32,430	687,559	450,155
Total	68,518,208	33,822,431	11,090,607	5,878,939	1,203,740	441,099	8,391,919	5,389,005
1952								
Jan.	5,847,011	2,788,426	846,891	449,935	101,211	38,150	743,233	470,126
Feb.	5,572,506	2,702,092	789,293	419,279	94,900	35,536	697,319	440,325
2 mo.	11,419,517	5,490,518	1,636,184	869,214	196,111	73,686	1,440,552	910,451

"TASK FORCE 'KEOKUK' AWAITING ORDERS, SIR!"
CHIEF KEOKUK: . . . and ready with Electro-Silvery to help industry attack problems of iron and steel production . . .
PRINCESS WENATCHEE: . . . like helping to make the metal that went into this tank and other products vital to the defense program . . .
CHIEF KEOKUK JR: Hey, Pop, what *is* Electro-Silvery?
CHIEF KEOKUK: Electro-Silvery, Son, is a form of ferro-silicon that acts as a vital control element in the production of iron and steel . . .
PRINCESS WENATCHEE: . . . and the largest producer in the world of this vital ingredient is Keokuk Electro-Metals Company!
Keokuk Electro-Silvery is used by foundries and steel plants in the form of these three pigs, weighing 60 pounds . . . 30 pounds . . . and 12½ pounds.
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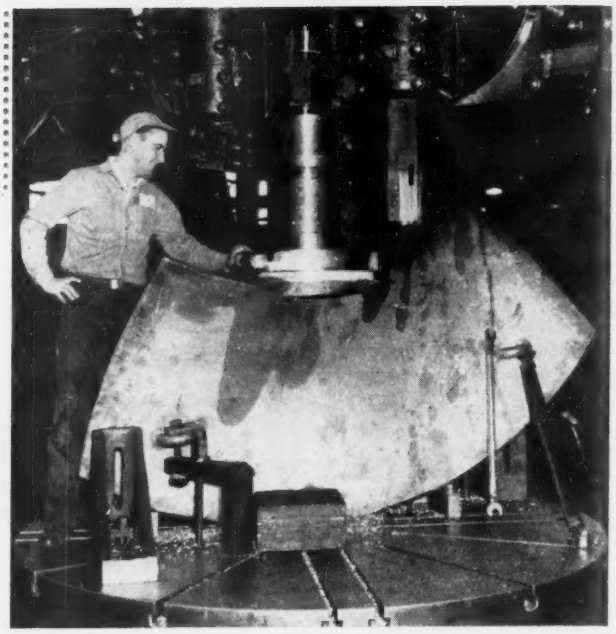
ELECTRO-METALS COMPANY
KEOKUK, IOWA
WENATCHEE DIVISION: WENATCHEE, WASHINGTON
SALES AGENTS: MILLER AND COMPANY
332 S. Michigan Ave., Chicago 4, Illinois
3504 Carew Tower, Cincinnati 2, Ohio
915 Olive St., St. Louis 1, Missouri
dick Stone

NEWS VIEWS



↑ BIG BLADE: Machining the stainless steel blade trunnion of a Kaplan turbine for a hydroelectric project in India. Baldwin-Lima-Hamilton Corp., Philadelphia, is building four 33,500-hp turbines for the development. The units incorporate what are said to be the largest stainless steel blades ever cast.

↑ FORD AT CLEVELAND: Management staff appointments at Ford Motor Co.'s new Cleveland foundry have been made by E. Claude Jeter, foundry manager. Standing left to right are: Eugene Buchman, quality control manager; R. H. Dunaway, industrial relations manager; Ford Paddock, production control manager, and E. E. Harkess, pattern department manager. Seated: E. E. Barnett, production manager; Mr. Jeter and A. M. Clark, plant and manufacturing engineering manager. H. M. Jones, plant controller, was absent when the photo was made.

↑ OPEN HOUSE: Hamilton Foundry & Machine Co., Hamilton, O., recently observed Business-Industry-Education Day at its plant, playing host to numerous visitors from the community who were conducted through the foundry and given first-hand information on casting practice.

← FREEDOM AWARDS: C. S. Anderson (right), president, Belle City Malleable Iron Co., Racine, Wis., receives a Freedom award for the company's publication "Foundryways." Another award went to the editor, Elaine M. Kitto, for her article, "The Opportunity of Freedom," a story of the displaced person in Racine. Presentations were made by Kenneth D. Wells (left), president, Freedoms' Foundation, Valley Forge, Pa.

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for effective chill reduction
for accurate hardness control
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Treat gray iron effectively for less than 10 cents per ton of castings! One ounce per 100 lbs. of iron will usually do the job.

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GRAPHITIZE WITH No. 8

170

THE UNITED STATES GRAPHITE COMPANY

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AROUND THE COUNTRY

News Reports from . . .

Los Angeles

FOUNDRY activity is somewhat softer. Thought to reflect the lull in general business conditions, the decline in activity is not viewed with alarm by local foundrymen.

Easing of building curbs and relaxation of materials controls in May had stimulated business for those foundries supplying the building trades. But last month a rash of strikes stemming from demands for higher wages by engineers, carpenters and reinforcing iron workers throughout California, brought many large and small construction projects to a halt. This served to take the bloom off renewed building activity.

Pipe foundries, with larger backlogs than for many months past, were hit by heavy order cancellations and requests for postponement of deliveries. With unfortunate timing shipments of Japanese-made soil pipe began to arrive for installation on government construction projects. All this contributed to setting back activity of soil pipe foundries to where they were in the fourth quarter of last year—a low period.

Inquiries from manufacturers for castings remain numerous but actual orders are fewer. Local observers say manufacturers are anxious to reduce their inventories before ordering additional castings.

Most active in the district are magnesium and aluminum foundries supplying the aircraft industry. These foundries face even better business prospects because more large contracts are expected by local aircraft manufacturers with the coming of the new fiscal year for the Air Force on July 1. Aircraft firms have large backlogs for commercial and military planes. Lockheed Aircraft Corp. has firm orders and contracts in negotiation totaling nearly $1.6 billion, the largest backlog in its history. Existing and new contracts will keep planemakers' plants busy through 1956 under the present "stretched-out" schedules.

Southern California Chapter of the AFS concluded a very successful year under leadership of retiring president Henry W. Howell, Howell Foundry Co. New officers for 1952-53 are: Harold G. Pagenkopp, Angelus Pattern Works, president; Hubert Chappie, National Supply Co., vice president; Charles Gregg, Gregg Iron Foundry, secretary; William Baud, Mechanical Foundries, treasurer.

Philadelphia

MOST gray iron foundries in this district continue to operate on a hand-to-mouth basis, with backlogs light and working schedules involving no more than four days a week. Exceptions are the pressure pipe foundries, which are running at least five days a week, and foundries engaged in making heavy castings for capital goods. Soil pipe shop production is picking up seasonally, although scarcely averaging more than four days a week.

Early effects of the steel strike resulted in the holding up of some gray iron casting orders, with prospects of heavier cutbacks if the strike proves to be prolonged. On the other hand, the steel strike had little early effect on steel castings, for the reason that supply was tight. Consumers were willing to take in the castings and store them, if necessary, rather than hold up. Currently steel casting shops are working five days a week. Backlogs average 15 to 20 weeks, production going mainly into capital goods and ordnance.

Due to pressure of business most steel foundries are planning to suspend for only one week for vacations, paying double time to those who have more than a week's vacation coming to them and who prefer to work. In contrast, most gray iron shops are planning to close down for two weeks because of sluggish demand. Those who have only one week's vacation coming will be laid off for an extra week. Major vacation time will fall in early July.

Most malleable shops will suspend for two weeks this summer. They are working five days a week, but with reduced forces. Their business is increasingly slack, few if any having more than a month's backlog.

Those in the nonferrous field which have defense work are busy; those which haven't are operating at little more than a nominal rate. The latter group takes in a number of small shops, many of which haven't the facilities for handling the specialized work specified for defense.

Apart from a few special alloys, nonferrous shops are experiencing no difficulty in obtaining needed metals. Neither are the ferrous shops having difficulty getting raw materials.

New York

APPROACHING vacation season indicates a further drop in district foundry operations. Many foundries will go down for at least a week or longer early in July. Actually it appears that more gray iron shops will be down for two weeks than has been the case in recent years because of sluggish demand. Meanwhile, jobbing shops are averaging four days a week or less. Some foundries are not employing a full working force for the days they are operating.

Lagging schedules apply to gray iron, nonferrous and to some extent malleable. Barring certain shops in each category, only steel foundries appear to be able to sustain a high

(*Concluded on page* 140)

HANDLING "TOUGH" MATERIALS?-

A 60′ Carrier Natural-Frequency screening conveyor for clay products, with 24″ pan made of ¼″ steel plate.
Capacity: 100 tons of 100-pound material per hour. 5 H.P. drive. Middle section of screen removed to show supporting bridge.

Close-up of drive — note patented drive linkage which always places weight of vibrating pan and conveyed materials on the spring supports, and never allows these loads to be imposed on the eccentric shaft and bearings.

anything that's hot, sharp, powdered, oily, abrasive, sticky, granulated or stringy?

Check These Advantages!

- **LESS POWER REQUIRED**
  (1000 foot-tons per hour per H.P.)
- **LESS MAINTENANCE & DOWN-TIME**
  (Less power + good design = good service)
- **GREATER CAPACITY**
  (From a dribble up to 200 tons per hour)
- **HIGH CONVEYING SPEED**
  (Up to 100 feet per minute, on flat hauls)
- **NO DAMPENING UNDER LOAD**
  (Designed with extra power for specified load, with positive stroke)
- **SELF CLEANING**
  (Continuous smooth trough—no pockets)
- **SCREENS, DEWATERS, SEPARATES, BLENDS, DRIES, COOLS**
  (Combines processing with conveying)
- **WIDTHS FROM 6″ TO 48″; LENGTHS FROM 5′ ON UP**
  (With pans 16 gauge to ½″ plate or heavier, open or enclosed)
- **BALANCED, VIBRATION-FREE UNITS AVAILABLE**
  (For use on ceilings or light floor construction)

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~~NATURAL-FREQUENCY~~
CONVEYORS

Carrier Natural-Frequency Conveyors work on a unique, patented vibrating principle which permits them to handle many materials that are too "tough" for most screw, belt, apron, vibrating and other conventional types of conveyors. These spectacular new conveyors also substitute the natural resonance action of coil springs for brute force. Result—*a tremendous reduction in power . . . far less wear-and-tear . . . and an absolute minimum of maintenance and down-time!*

Carrier Natural-Frequency Conveyors — including vertical vibrating spiral types — are now racking up amazing conveying records for scores of America's biggest, most successful industrials. Let us prove to you that they will move *your* product more quickly, efficiently and economically. *Mail the coupon — no obligation of course!*

Carrier Conveyor Corporation (formerly Whitley-Carrier Co.)
Frankfort Avenue at Clifton, Louisville 6, Kentucky

Gentlemen:

Without obligation, please send me Carrier Natural-Frequency Conveyor Bulletin No. 108.

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Street _____

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Att. Mr _____ Dept. _____

(*Concluded from page* 138)

operation. These latter have a substantial volume of defense work, as well as a good backlog of capital equipment business.

Exceptions in the other classifications are those able to develop a good volume of business in these lines. Small nonferrous shops, as well as gray iron foundry shops, are finding the going pretty tough. These plants are not generally equipped to take on specialized ordnance work, leaving them only civilian business, which for some time past has been spotty.

Despite lagging production at various shops there does not appear to be any particular easing in the supply of molders or core makers. Common labor, however, is plentiful. Raw material supplies are adequate and in the case of cast iron scrap supply is decidedly plentiful.

TURRETS and hulls for the new M-47 medium tank recently accepted by the Army are being produced by American Steel Foundries at its East Chicago Cast Armor Plant. Under a contract awarded the Chicago Ordnance District, more than 3800 employees are engaged in manufacturing the cast steel armor for this new vehicle.

Eventually, employment at the plant is expected to reach 6600, according to C. C. Jarchow, company president. This would be 50 per cent more than the World War II high when more than 70,000 tons of heavy-duty armor castings, chiefly tank turrets, was turned out.

Although details of the armor being cast are not divulged, the Department of Defensee has revealed that armor protection for tanks has been improved greatly.

The Aircraft Engine Division, Ford Motor Co., here, once again is on a three-engine R-4360 Pratt & Whitney Wasp Major schedule. Maynard T. Murray, division general manager, announced recently that the third engine under the program to be built at the plant will be the 59 model, originally slated for production here. This is the engine used on the four-engine C-97 Boeing cargo carrier.

Meanwhile, good progress is being made in preparations for manufacturing the J-57 Pratt & Whitney turbo jet, believed to be the most powerful engine of its type in the world. Contract for producing this engine was negotiated early this year. The magnesium foundry recently received its first blueprint for a jet part and is surveying its area prior to setting up the necessary production lines.

The Aircraft Division has installed two "Direct Reader" spectographs to provide accurate and rapid qualitative and quantitative analysis of metallic elements present in various materials. One of these units is in the foundry laboratory and will be used for analysis of aluminum and magnesium alloys.

With the spectograph it is possible to obtain an analysis in a matter of a few minutes instead of the hours and even days sometimes required by conventional "wet" chemistry. By means of electronics and calibrated clock dials quantities of various elements are read directly in percentage.

Gray iron foundries in this area are becoming concerned once more over future pig iron supply. Loss of production due to the steel strikes is very likely to cause a pinch. Iron supply had not eased in this district to the extent it had in some others, suppliers being obliged to keep close control on distribution to customers. On the other hand, supply was good enough that foundries had lost interest in imports and domestic tonnage from out-of-the-district blast furnaces which involved excessive freight charges. Interest in both these sources may revive now, particularly if there is any appreciable pickup in demand for castings. First step, however, is likely to be more use of scrap in cupola mixes. Cast scrap at present is available in abundance and the market has been sagging below ceiling prices for many weeks.

Marks 125th Year

Joseph Dixon Crucible Co., Jersey City 3, N. J., this year celebrates its 125th anniversary. It is said to be one of 14 business firms in the country to have reached or passed this milestone. Originated by Joseph Dixon at Salem, Mass., in 1827 for the manufacture of graphite crucibles, the business was moved to Jersey City after the Mexican War. There it was incorporated under its present name in 1868. Today the company produces a number of graphite products, refractories and stationery supplies.

Meetings of Interest to Foundrymen

July 25—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Sept. 8-10—American Standards Association, national standardization conference, Museum of Science & Industry, Chicago

Sept. 8-12 — Instrument Society of America, annual meeting, Cleveland

Sept. 18-19 — National Foundry Association, annual meeting, Edgewater Beach Hotel, Chicago

Sept. 22-23—Steel Founders' Society, fall meeting, the Homestead, Hot Springs, Va.

Sept. 26-27—Ohio Regional Foundry Conference, Ohio Chapters, AFS, and Ohio State Student Chapter, Ohio State University, Columbus, O.

Oct. 16-17—Gray Iron Founders' Society, annual meeting, Hotel Cleveland, Cleveland

Oct. 16-18—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 17-18 — Michigan Regional Conference, Central Michigan, Detroit, Saginaw Valley, and Western Michigan Chapters, AFS, University of Michigan, Ann Arbor, Mich.

Oct. 20-24 — American Society for Metals, National Metal Congress and Exposition, Philadelphia

Oct. 24-25—Northwest Regional Foundry Conference, Oregon, Washington, and British Columbia Chapters, AFS, Multnomah Hotel, Portland, Oreg.

Oct. 30-31—Metals Casting Conference, sponsored by Purdue University, Michiana and Central Indiana AFS chapters, Purdue University, West Lafayette, Ind.

Nov. 13-14—Southwestern Regional Foundry Conference, Texas and Tri State Chapters, AFS, Baker Hotel, Dallas, Tex.

Nov. 19 — American Standards Association, annual meeting, Waldorf-Astoria Hotel, New York

Dec. 4-6—American Institute of Mining & Metallurgical Engineers, electric furnace steel conference William Penn Hotel, Pittsburgh

1953

May 4-8—American Foundrymen's Society, annual convention, Chicago

June 29—July 3—American Society for Testing Materials, annual meeting, Chalfonte-Haddon-Hall, Atlantic City

We confidently introduce two performance-proved Ironton refractory developments "TEAMED FOR SERVICE"

IRONTON RAVENITE

Black plastic *IRONTON* RAVENITE is the new material for lining all types of ladles. Its graphite content gives higher resistance to slag and metal penetration in cupola spouts, breasts and slag holes, too.

IRONTON RAVENITE is packed in drums or cartons, and has excellent workability for hand or air ramming. When repairs are necessary, *IRONTON* RAVENITE is easily cleaned and new material will form a good bond with the old.

IRONTON GUN-ON

Air-placement lining for cupolas operating 12 to 16 hours

Closely grain-sized *IRONTON* GUN-ON is the new maximum-density lining for air placement in the cupola. *IRONTON* GUN-ON is very resistant to slag and metal cutting action. Most economical service is promised by the "build up" in the melting zone where less material is required to line the cupola.

IRONTON GUN-ON is made to meet the conditions prevailing in foundries on a twelve to sixteen hour production schedule. *IRONTON* GUN-ON is laboratory controlled to reduce the percentage of drop and to insure a product free of lumps. We know how important it is to avoid clogging the gun, and *IRONTON* GUN-ON is your best bet to avoid costly delays.

Call Ironton 109 or write for the name of the Ironton Representative near you

RELIABLE REFRACTORIES

THE IRONTON FIRE BRICK COMPANY
IRONTON, OHIO

BERLITE • ALSET
CARO-LINE • NOJOINT • SPECIAL SHAPE REFRACTORIES
KENTUCKY CLAY FIRE BRICK PRODUCTS

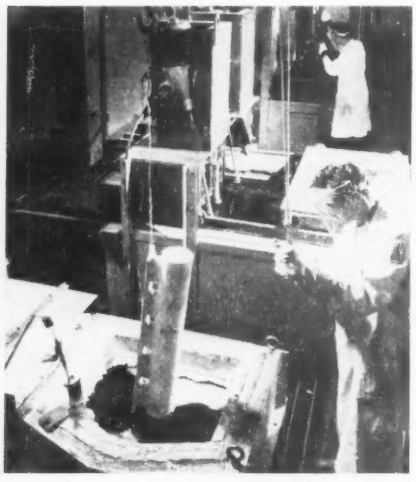
By EDWIN BREMER

Foundry DEVELOPMENTS

NEW dipping process for coating steel and other ferrous metals and alloys has been developed by A. L. Boegehold, C. J. Tobin, D. K. Hanink and H. L. Grange, General Motors Corp., Detroit. Called "Aldip" the procedure consists of immersing the part in an alkaline cleaner to remove dirt, oil, grease, etc., washing in hot water, acid pickling, rinsing and drying. Then the part is dipped for approximately 4 minutes in a preheat salt bath at temperatures ranging from 1280 to 1400°F. Part is transferred to an aluminum bath covered with a layer of salt flux about ½-in. thick, and allowed to remain from 30 seconds to 1 minute. From the aluminum bath the still red-hot part is returned to the preheat salt bath, and then slowly removed. Microscopic examination of the aluminum layer indicates an outer coat of aluminum-bearing iron, and a second layer next to the steel as an iron-aluminum alloy.

* * *

REPORTS of interest to foundrymen now available from the Office of Technical Services, Department of Commerce, Washington 25, include: PB 103 559, "Solidification of Steel from Sand and Chill Walls," 29 pages, price 50 cents; PB 103 562, "Solidification of Gray Iron in Sand Molds," 19 pages, price 50 cents, and PB 103 915, "The Contribution of Riser and Casting End Effects to the Soundness of Cast Steel Bars," 12 pages. price 50 cents.



Aluminum coated manifold being lifted from molten metal bath

* * *

FORMULA for the liquidus temperature of gray irons, according to Porter and Rosenthal in a paper presented at annual meeting of the American Foundrymen's Society, is °F=2981—218F, where F is the composition factor, C+0.5P+0.25 Si. The latter should not be confused with the carbon equivalent formula, C+1/3(Si+P).

* * *

NEW local treatment for burns, described by P. E. Spangler in *U.S. Armed Forces Medical Journal*, January, 1952, consists of application of a gel composed of partially hydrolyzed casein, sodium lactate and sodium laurel sulphate. That is followed by a four-ply, coarse-mesh impregnated with zinc acetate. Method is said to be superior to others due to quick and easy application, rapid amelioration of pain and distress, greatly reduced incidence of infection, prevention of loss of serum, etc. It is claimed that first and second degree burns healed in 5 to 12 days, self-debriding of third degree burns in 12 to 14 days, and minimum scarring.

* * *

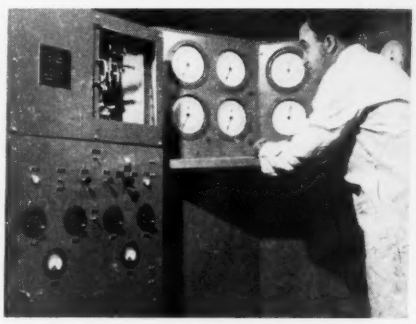
NATIONAL Bureau of Standards recently has published a 206-page book *Mechanical Properties of Metals at Low Temperatures* which may be obtained from the Government Printing Office, Washington 25, for $1.50. Papers included cover recent European work in the field; manufacture of steels, development and application of Cr-Cu-Ni steel, and application of metals in aircraft for low-temperature service; tensile properties of Cu, Ni, and some Cu-Ni alloys, properties of austenitic stainless steels, and mechanical properties of high-purity Fe-C alloys at low temperatures; dimensional effects in fracture; and brittle fracture in ship plates.

* * *

BRITISH foundry reports excellent results with cores bonded with urea formaldehyde resin in gray iron castings. Core mixture is composed of 380 lb dried fine silica sand, 20 lb red sand (10 per cent clay), 5 lb dextrin, and 4 pints resin. Method of mixing is to place sand in the mixer followed by the resin and the water (wetting agent: 25 cc in 2 pints water), and mix for 2 minutes. Then the dextrin is added and the mixing continued for 1 minute.

* * *

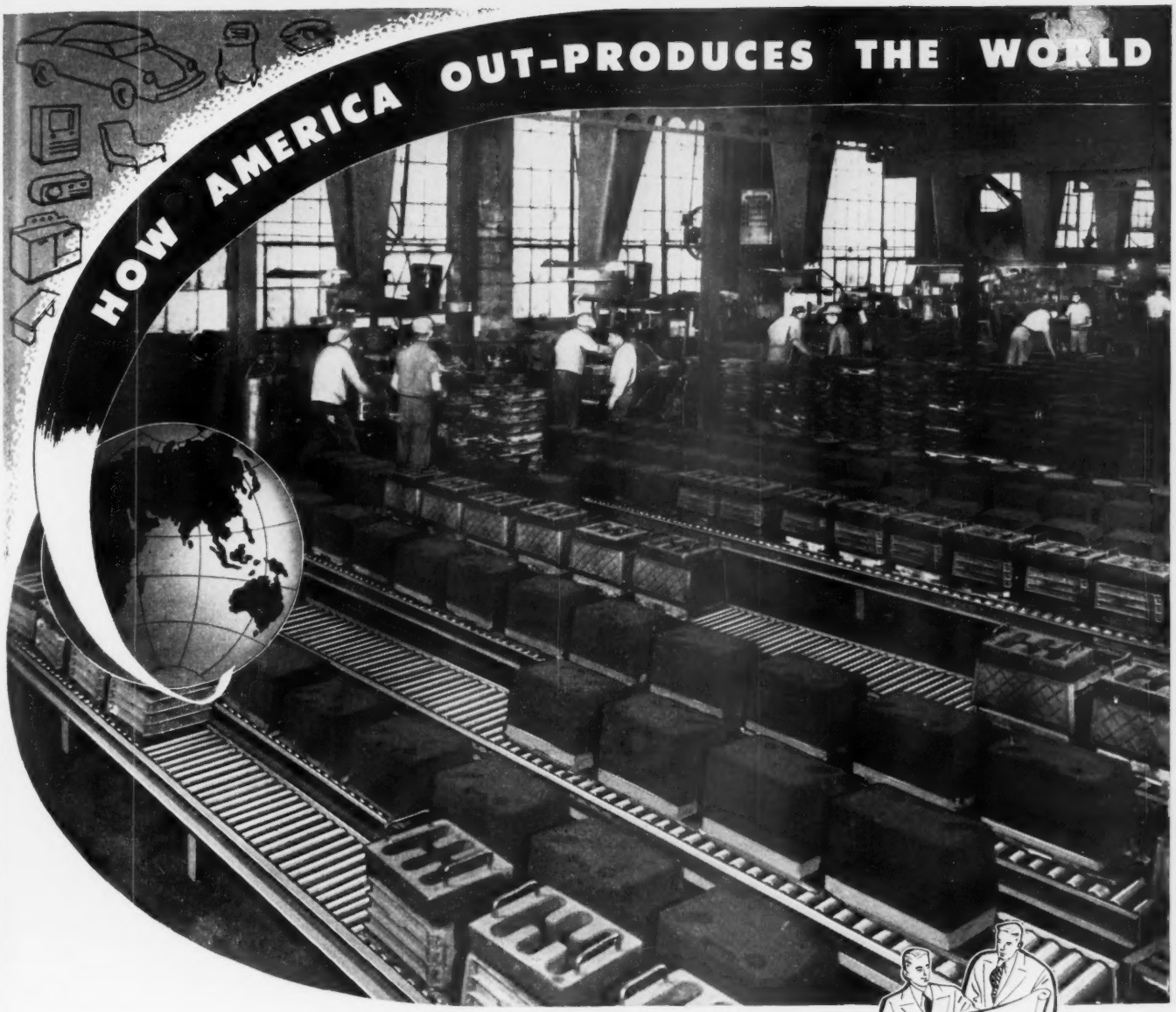
ACCOMPANYING illustration shows the new recording spectrograph installed at Cleveland Engine Plant of Ford Motor Co. Spectrum lines of various elements generated when a metallic alloy is arced, are picked up by photo-electric tubes, which measure their intensity, and record them on the appropriate dials shown on the apparatus. Unit will be used for analyzing molten metal



to be poured into castings in the foundry as well as scrap materials charged into the cupolas, for checking purchased parts, etc.

* * *

PRACTICAL process for electrodepositing aluminum at room temperature has been developed by D. E. Couch and Abner Brenner, National Bureau of Standards, using a new type organic bath. Aluminum plating bath is prepared by adding either lithium hydride or lithium aluminum hydride to an ethyl ether solution of anhydrous aluminum chloride. Ether should be anhydrous and alcohol-free. Concentration of $AlCl_3$ may vary from 1 to 4 molar. Current densities may be as high as 4 to 5 amp per sq dm, but for thick deposits should not be over 2 amp per sq dm. Bath is prepared and used in a closed container to prevent entrance of moisture. No agitation of bath is necessary. Lithium hydride content of bath should not be less than 3 to 4 grams per liter to prevent hard, brittle, gray deposits.



Machine tool and diesel engine castings produced on flow principle. Molds move on Logan Roller Conveyor from molding machines through pouring and cooling to shake-out.

3

American Industry { "Puts flow into production, at every possible operation"

Keep it moving is one of the first rules for efficient production. Frequent stops and starts mean waste motion, waste effort and time.

One of the principal factors in keeping things on the move, is correctly engineered conveyors. Logan equipment for instance, links up various foundry processes, delivers molds, flasks and castings at convenient working heights, dispatches them without manual effort to the next operation, or to shipping department, puts-flow-into-production in countless American foundries.

Remember too, you get that "something extra" in engineering and design when you specify Logan Conveyors. Write for nearest field engineer to call.

Logan Conveyors

LOGAN CO., 580 CABEL ST., LOUISVILLE, KY.

More than 100 examples of metallic and nonmetallic surface treatments for gray iron castings featured the interesting exhibit of the Gray Iron Founders' Society at the AFS Foundry Show in Atlantic City. The society has been active in development work in the field of surface finishes in recent years

International Congress

(*Continued from page* 113)

little or no effect near the eutectic.

Above 350° F superheat fluidity increases rapidly on a straight-line function as temperature increases. As pouring temperatures approach the liquidus temperature, fluidity deviates more and more from a straight-line function, decreasing to a zero measurement on the fluidity spiral slightly above the liquidus regardless of composition. The authors propose a formula and chart relating effects of composition and temperature to fluidity.

Concluding paper at the session, on influence of phosphorus on hot tear resistance, by J. C. Hamaker Jr., General Iron Works, Denver, and W. P. Wood, University of Michigan, Ann Arbor, Mich., was discussed by Mr. Hamaker. He stated the authors found that gray irons containing 0.04 to 0.16 per cent P were found most susceptible to hot tears in the range 1900 to 1800° F while 0.25 per cent P irons were subject to hot tearing over the extended range 1900 to 1700° F. Tensile strength in tearing range varies from 1600 to 3500 psi, indicating that stress concentrations must reach such values for hot tear formation.

Liquid phosphide eutectic greatly increases hot tearing tendency by reducing strength in the temperature range. In alloyed iron an increase in P from 0.04 to 0.16 per cent may produce a hot strength reduction of over 30 per cent. Individual or balanced additions containing Mo or Cr sharply reduce hot strength at P levels as low as 0.10 per cent by segregating to the phosphide eutectic to increase its volume. Ni also decreases hot strength to some extent at P levels above 0.12 per cent. With fixed strength specifications a reduction in base P content appears to be the only compositional change of positive value in prevention of hot tears.

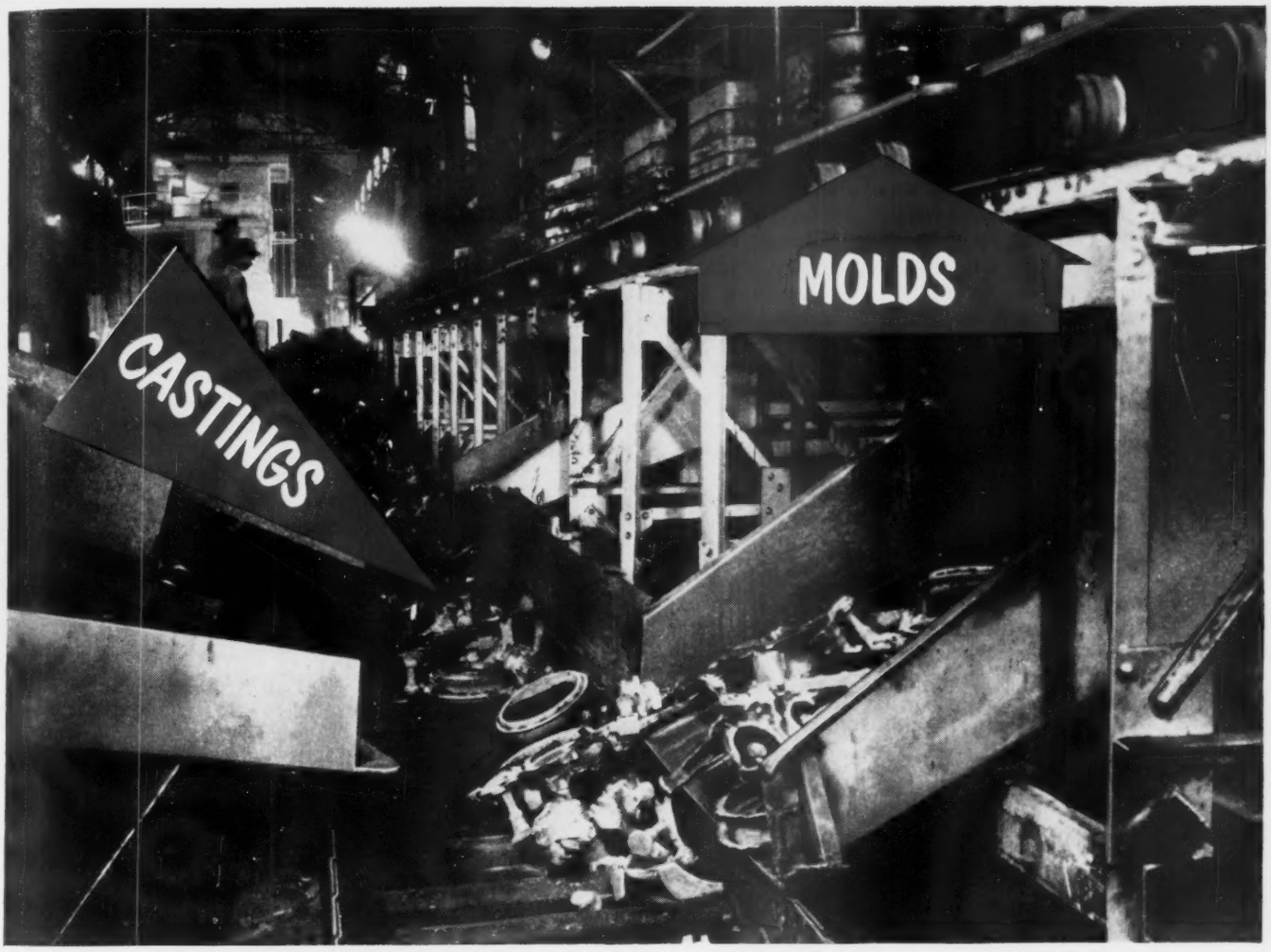
At the succeeding session under the direction of W. H. White, Jackson Iron & Steel Co., Jackson, O., and Carl Harmon, Hanna Furnace Corp., Buffalo, Richard Schneidewind presented a paper on commercial experience with higher silicon nodular irons prepared in co-operation with H. H. Wilder, Vanadium Corp. of America, Detroit. He pointed out the difficulty of producing such iron with a silicon content of 2.5 per cent or under with a late silicon inoculation, particularly if the nodulizing alloy is a ferrosilicon-magnesium type. In a study of the effect of Si the authors concluded that yield and tensile strengths and brinell hardness of annealed nodular irons increase as Si increases. Elongation drops gradually with increasing Si, but at 4 per cent Si can still be over 10 per cent. In the as-cast condition properties of the iron are affected greatly not only by cooling rate but also by the amount of Si inoculant. Nodular irons can be made with Si contents up to 4 per cent which will be acceptable with respect to ASTM specifications, and it is probable that for special applications nodular irons with over 4 per cent Si will prove valuable.

In the discussion Henton Morrogh, British Cast Iron Research Association, Birmingham, England, questioned whether ductility is measured by elongation, and said that in England the impact value is specified. Also it was found that Si affected the notch-impact value seriously. George A. Conger, University of Michigan, verified this statement. A. B. Everest, Mond Nickel Co. Ltd., London, stated that 2.5 per cent Si is the limiting value where the transition from ductile to brittle fracture occurs and impact values decrease from 4 to 10 per cent.

Concluding paper by E. A. Rowe, University of Washington, Seattle, and H. A. Johnson, General Electric Co., Richland, Wash., on effect of cerium on graphite formation was presented by Mr. Johnson. It was found that cerium affects graphite structure in all melts. Alone it tends to produce oriented graphite of type E formation which lowers tensile strength as well as causing pronounced chilling effect. Addition of a secondary inoculant improves tensile strength and graphite structure. Both type and amount of secondary inoculant influence amount of acicular pearlite produced. In alloy cast iron maximum tensile strength is associated with amount of acicular pearlite and size of type A graphite. Most desirable physical properties are obtained with 0.04 to 0.05 per cent Ce with 1 to 1.2 per cent Si added by ferrosilicon as the inoculant.

Next session, with F. T. McGuire, Deere & Co., Moline, Ill., and W. A. Hambley, Chas. A. Krause Milling Co., Birmingham, Mich., presiding.

(*Continued on page* 146)



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You'll like Jeffrey Foundry equipment . . . the way each unit is engineered for the job it is to do . . . the way our engineers help you determine the best arrangement suited to your operations. It all adds up to a smooth-running system . . . more profits for you. May we hear from you?

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(*Continued from page* 144)

related to effect of sulphur on fluidity, internal porosity, and influence of hydrogen on graphitization. First paper, prepared by L. F. Porter and P. C. Rosenthal, University of Wisconsin, on sulphur and fluidity was presented by Mr. Rosenthal. Investigation indicated that sulphur in itself does not decrease fluidity, but in combination with manganese forms high melting point MnS particles which decrease fluidity. Decrease in fluidity is related to amount of S and pouring temperature. The higher the pouring temperature the greater the amount of S that can be tolerated before fluidity is decreased.

J. C. Hamaker Jr., General Iron Works Co., Denver, in co-operation with W. P. Wood, University of Michigan, and F. B. Rote, Albion Malleable Iron Co., Albion, Mich., discussed internal porosity in gray iron castings. Study of a bottom-gated, unfed 4-in. cube casting showed that visible internal porosity tends to appear in plain gray iron whenever the P exceeds about 0.25 per cent. Higher P increases magnitude of spongy regions while reductions to 0.13 per cent decrease microporosity. Mo and Cr. additions sharply reduce the critical P for visible porosity and subsequently increase the magnitude of voids at a given P level.

Mo tends to concentrate porosity in visible spongy regions while Cr produces smaller visible voids and more widespread microporosity. Straight Ni additions reduce porosity in plain irons to some extent, but balancing additions to Mo and Cr. irons have little or no effect. Internal porosity of this type persistently appears in hot spots in castings at given P and alloy levels despite wide variations in C and Si or inoculation treatments. If porosity of this type is encountered check for high P or alloys in charge materials or a build-up of alloy residuals in return scrap.

Effect of hydrogen on graphitization was the subject of a paper by B. F. Brown, North Carolina State College, Raleigh, N.C., and M. F. Hawkes, Carnegie Institute of Technology, Pittsburgh. In discussing it Mr. Brown said H inhibits graphite formation during solidification of the eutectic, by gamma-range graphitization of cementite, by rejection on cooling along the A_{gr} line, by decomposition of austenite by the stable eutectoid reaction, and by the alpha-range graphitization of cementite.

At a roundtable luncheon held Tuesday noon the presiding chairmen were R. J. Allen, Worthington Corp., Harrison, N. J., and C. O. Burgess, Gray Iron Founders' Society, Cleveland. A. B. Everest, Mond Nickel Co. Ltd., London, England, gave a brief resume of the "Code of Practice for the Repair and Reclamation of Grey-Iron Castings by Welding and Allied Methods" which was prepared for guidance of British operatives, engineers and inspectors by the British Institute of Foundrymen.

Bela Ronay, U. S. Naval Experiment Station, Annapolis, Md., described reclamation of demountable diesel cylinder heads which cracked between ports during operation. John Mikulak, Worthington Corp., Harrison, N. J., described setting up standards for repair procedures.

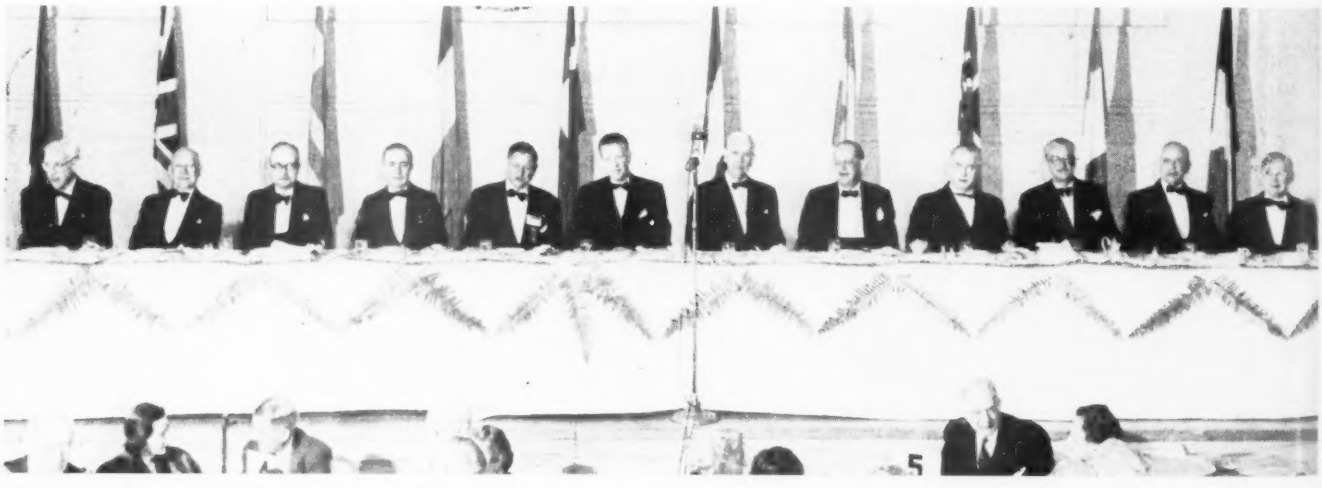
Nodular irons were considered at a later session under the direction of J. E. Rehder, Department of Mines & Technical Surveys, Ottawa, Ont., and V. A. Crosby, Climax Molybdenum Co., Detroit. Alvin Shames, North American Aviation Inc., Columbus, O., in discussing a paper prepared by himself and R. W. Lindsay, Pennsylvania State College, State College, Pa., on effect of percentage of nodular graphite on mechanical properties stated that ultimate strength, elongation and endurance limit increase rapidly with increasing percentage of nodules in the structure up to between 50 to 60 per cent nodules, and that behavior is the result of the presence of stubby flakes instead of normal flakes and nodular graphite. High values of ultimate strength, ductility and endurance limit comparable with those for a fully nodular iron may be obtained with a substantial amount of stubby flake graphite present and with irregularly shape nodules.

In the ensuing discussion R. A. Flinn, University of Michigan, said that the authors' conclusions require careful consideration as the difference in properties may be due to a change in matrix structure rather than to change in nodule count, and the former could be determined by a brinell hardness survey or a determination of combined carbon content.

J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, asked about differences in modulus of elasticity, and Gosta Vennerholm, Ford Motor Co., Dearborn, Mich., stated that the shape of the nodules is important relative to the modulus since with round nodules the modulus of elasticity is around 28,000,000 psi while with ragged nodules it is only about 17,000,000 psi.

Jack Keverian, in co-operation with C. M. Adams and H. F. Taylor, all of Massachusetts Institute of Technology, gave a discussion on formation time of spherulites which concluded that the nodules precipitate in

(*Continued on page* 148)



ALUMNI DINNER: At the speaker's table for the annual Alumni dinner were, left to right: Robert E. Kennedy, Dr. G. H. Clamer, Tom Makemson (England), I. R. Wagner, L. N. Shannon, W. J. Grede (speaker), Walton L. Woody, Walter L. Seelbach, William W. Maloney, Robert Crignier (Belgium), Ralph J. Teetor, Charles E. Hoyt

choice of the foundrymen...

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(*Continued from page* 146)

the melt above eutectic temperature.

In the discussion W. S. Pellini, Naval Research Laboratory, Washington, stated that his studies and observations of nodular iron led him to believe that the nodules form during undercooling, not above, but somewhat below the eutectic temperature.

Final paper at the session, on "A Study of the Formation of Nodular Graphite" by Frederick Hurum, Norway Institute of Technology, Trondheim, Norway, in absence of the author was presented in abstract form by Mr. Keverian. The author suggests formation of nodules is due to formation of X particles consisting of carbides and silicides precipitated in a high-silicon fluid by the action of carbon and a nucleating effect which may or may not be due to magnesium. Those particles decompose to form a slimy fluid called Z-liquid, and the nodules are formed by precipitation of graphite on the minute particles of Z-liquid.

Properties of Nodular Iron

At the next session, with A. P. Gagnebin, International Nickel Co., New York, and Richard Schneidewind, University of Michigan, presiding, C. C. Reynolds and H. F. Taylor, Massachusetts Institute of Technology, briefed a report on physical properties of nodular iron. This indicated that Mn over 1 per cent decreases as-cast properties and annealing improves properties by breaking up carbide formation. Phosphorus increases shrinkage, although up to 0.1 per cent increases tensile and yield strengths. Magnesium in the proper range 0.05 to 0.10 per cent has no effect on properties, and Ni gives some increase in properties.

In the discussion T. E. Eagan, Cooper-Bessemer Co., Grove City, Pa., pointed out that many of the compositions employed by the authors are not commercial; this would change the picture as far as data on properties are concerned.

R. P. Dunphy and W. S. Pellini, Naval Research Laboratory, described a solidification dilatometer and its application to gray iron. Henton Morrogh, British Cast Iron Research Association, Birmingham, England, discussed the subversive effect of a number of elements such as Pb, Sb, Bi, and Ti in inhibiting the formation of nodular graphite, and how that could be circumvented by use of cerium in combination with magnesium. Best results, according to the speaker, are obtained by using a Ni-Mg-Ce alloy containing 10 to 18 per cent Mg and 0.5 to 3 per cent Ce.

Closing session on gray iron had J. S. Vanick, International Nickel Co., New York, and T. E. Eagan, Cooper-Bessemer Corp., in the chairs. N. A. Birch, National Bearing Division, Meadville, Pa., presented a report on gating and risering terminology which is to be published by the AFS.

W. A. Schmidt presented a progress report on gating and risering of gray iron which was prepared in co-operation with H. F. Taylor. It described the investigation on that subject at Massachusetts Institute of Technology. Spheres poured in dry sand were solid while those in green sand showed shrinks. Treatment of the metal with various gases showed that hydrogen, oxygen and water vapor caused shrinks in dry sand and aggravated them in green sand. Appearance of shrinks in green sand may be due to dilation of sand since by mechanically restraining that phenomenon, they were decreased. Higher pouring temperatures gave better feeding of the castings, and no feeding occurred when the temperature was slightly under the liquidus.

TIMESTUDY AND METHODS

THE two sessions arranged by the Timestudy and Methods Committee were well attended. Considerable interest was evidenced in a discussion of the "Use of Motion Pictures for Foundry Motion and Timestudy," presented at the first session by Prof. W. K. Richardson, Purdue University, Lafayette, Ind. Chairman was L. W. Lehman, John Deere Van Brunt Co., Horicon, Wis., and H. R. Williams, Williams Management Engineering, Milwaukee, was co-chairman.

It was pointed out that motion pictures first were applied to motion study 40 years ago by the Gilbreths. An advantage is that short-cycle jobs may be studied minutely by analyzing them one motion picture frame at a time. Foundry operations requiring five or six people as a team may be analyzed by charting the activity of each member in the group individually.

Motion pictures also offer a permanent record of how the job is done and how the rate was set. They provide greater detail than a written job description and are more accurate. An added advantage is that the film also can be used for training. Pictures may be taken at 1 frame per second, consequently 100 feet of film will record an hour's work and in charting the job the task of counting the time involved per operation is simplified. Finally, motion pictures permit the industrial engineer to analyze and rate a job away from shop distractions.

M. T. Sell, Sterling Foundry Co., Wellington, O., discussed "Application of Motion Pictures for Motion and Timestudy in the Foundry." He accompanied his talk with a film used by the company in developing its standard data tables for bench coremaking in 1946. These standards still are in use.

To analyze a motion picture study, the counter on the projector is set at zero and the projector is turned by hand until the desired "breaking point" between the first and second work element is reached. Then the readings from the frame counter are recorded. The analysis sheet has the appearance of a continuous stop watch study since the pictures were taken by an electrically driven camera at 1000 frames per minute. Thus the values are in increments of thousandths of a minute.

Mr. Sell listed several elements which are so small they cannot be accurately separated and recorded when using a stop watch, yet many of these elements are constants which, when added up in this particular job, amounted to 15 per cent of the total time required to make the core.

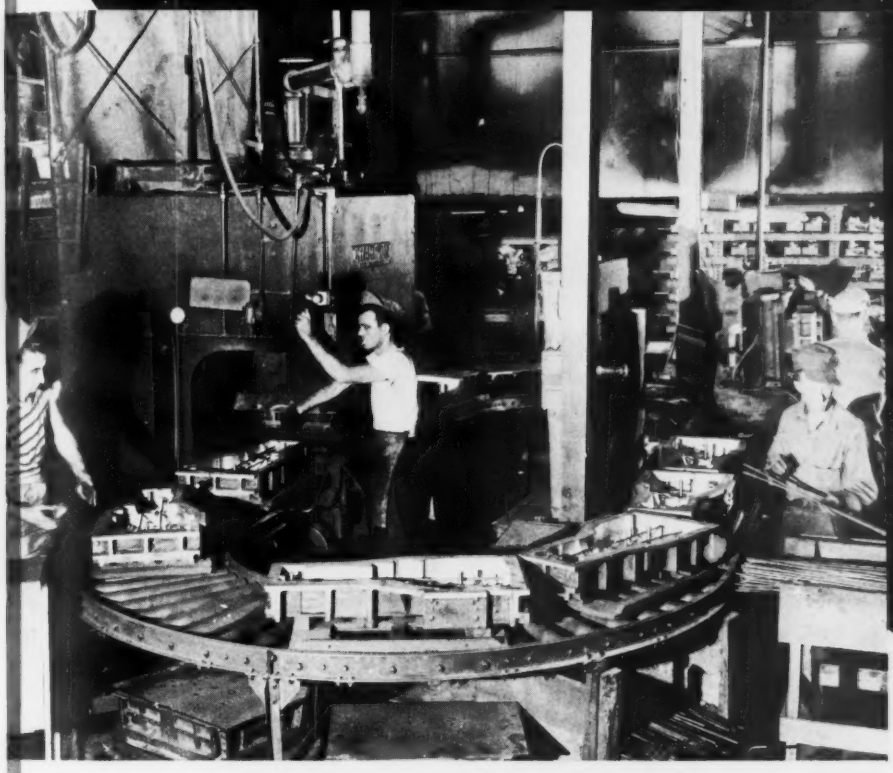
John R. Walley, foundry specialist, Helmick & Associates, Canton, O., presented the session's concluding paper. "Applied Waste Control Principles" against time, effort, space, materials and power were outlined as consisting of six steps. The first step is to spot a source of waste; the second is to write out the main work elements of the job as the operations are performed and then ask questions about each of these work elements. Finally when the new procedure or method has been devised, it must be approved and put into effect.

Mr. Walley pointed out the advantages of teaching these waste control principles to supervisors in the plant and stated the ground could be covered in three one-hour meetings. He suggested for the first meeting that the instructor present a well-known foundry operation and guide the group in applying the principles of waste control to solving the problem and then summarize the principles before closing the session.

(*Continued on page* 153)

from the smallest...

A Champion CB-5 Core Blower in operation at General Malleable Corp., Waukesha, Wisconsin. The special stacking feet on the core dryers combined with the high production of the CB-5 permit maximum efficiency on this job . . . the blowing of port cores for diesel engine blocks.



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At the Golden Foundry Company, Columbus, Indiana, up to 180 large half-barrel cores are blown each hour on this high production coremaking unit with a Champion CB-400 Core Blower. Core boxes are rolled over on the Johnston and Jennings 612 Rollover Draw machine in the loop at the right. For small cores or for the very largest, you just can't beat a Champion for production and efficiency.

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From the small CB-5 to the huge CB-400, every Champion offers the same proven performance—the same unequalled production. Equipped with Champion's advanced design manual control, or available with Blo-Matic, the only fully automatic core blower cycle control, in the larger machines; each machine is adapted to a wide range of jobs. There's a size to meet *your* exact requirements!

THE CHAMPION:	BLOWS CORES UP TO:
CB- 5	4½ lbs.
CB- 10	11 lbs.
CB- 12	30 lbs.
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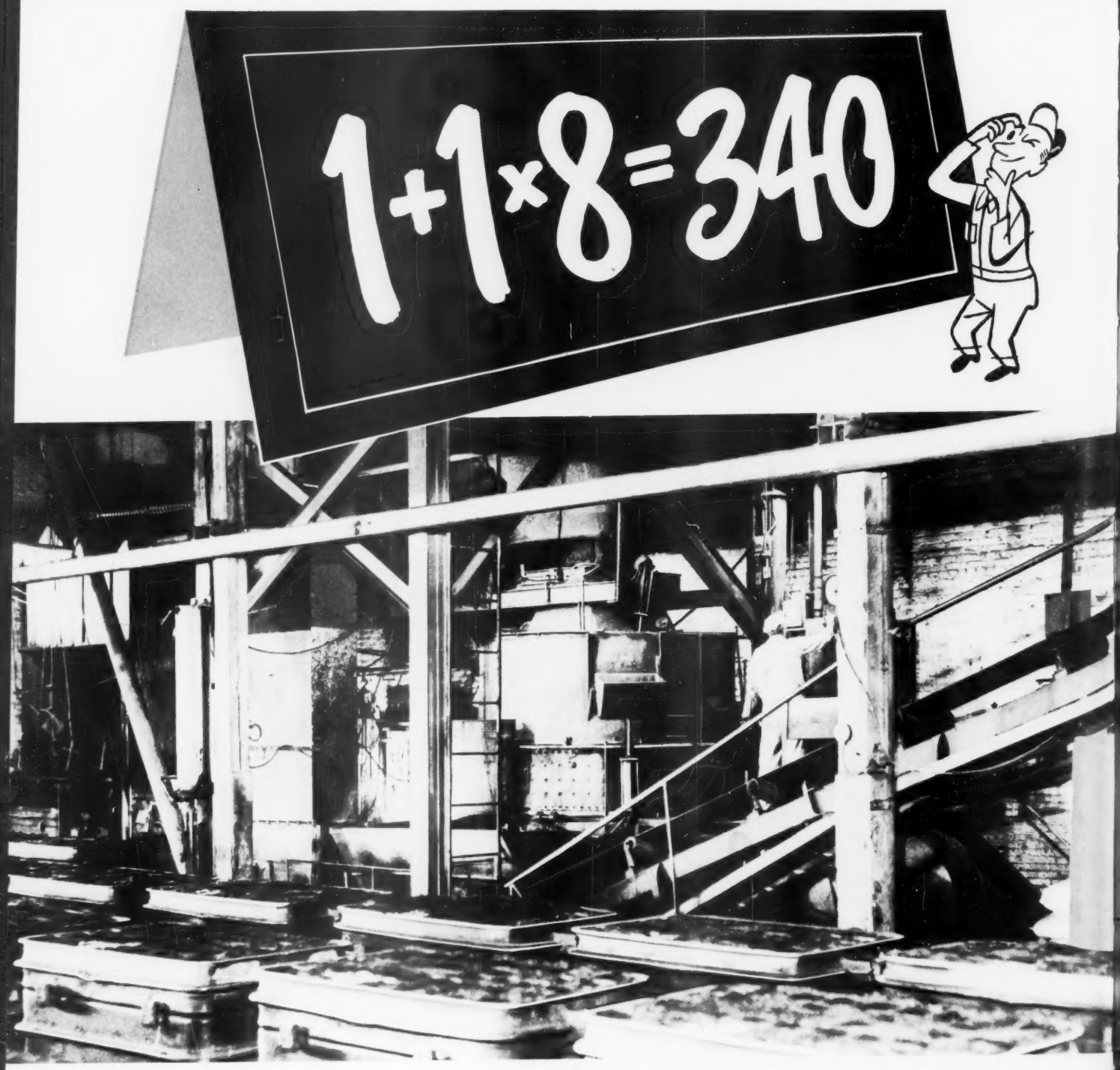

An "80" Speedmullor for molding sand. When space is at a premium—as it is here—the high capacity of the Speedmullor is doubly important. Krause's Model "80" Speedmullor thoroughly mulls and cools their entire molding sand requirement—up to 340 tons in less than 8 hours. One man handles the entire sand preparation job.

And a Mulbaro mulls all the core sand. With their molding sand preparation problems solved by a Speedmullor, the foundry installed a Model 3½ Mulbaro to mull all of their core sand. Using four portable barrows, Krause is able to attain almost continuous operation with their Mulbaro. Most sand handling is eliminated, since coremakers use sand directly from the Mulbaro's portable barrows.

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At Krause Plow Corp., Hutchinson, Kansas . . . the entire foundry's molding sand requirement —*340 tons a day*—is completely mulled and thoroughly cooled during one eight-hour day in a single Model "80" Speedmullor. With the Speedmullor's simplified manual controls, one man handles this entire sand preparation job.

Sand is discharged into the mullor in 2000-lb. batches by a measuring batch hopper. The time required for the complete cycle—mulling, cooling and discharge—is only 1½ minutes. This compares to a five- to seven-minute cycle required with the conventional type mixer formerly used, and the quality of the sand is greatly improved.

All of Krause's core sand is prepared in a Mulbaro. Krause uses four barrows with one Mulbaro mulling mechanism, making it possible to mull sand in one barrow while the other barrows are in use at the coremaking stations. Sand is used by the coremakers directly from the barrows, thus eliminating unnecessary sand handling.

Here's another foundry applying BETTER METHODS to meet their demands for mulled molding and core sand. The Speedmullor and Mulbaro—truly today's answers to mulling problems—are doing a real job at Krause Plow. They can do the same job in your foundry. Send today for more information!

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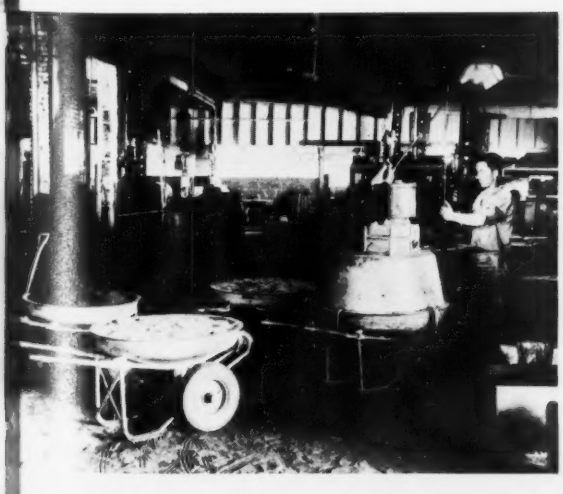

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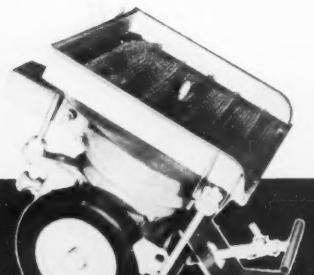
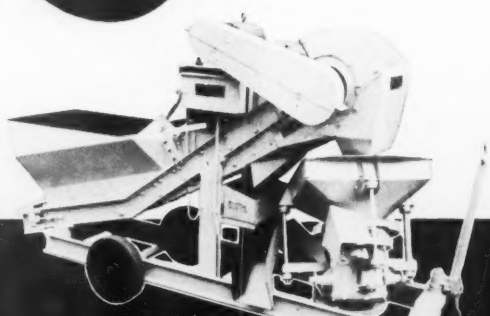
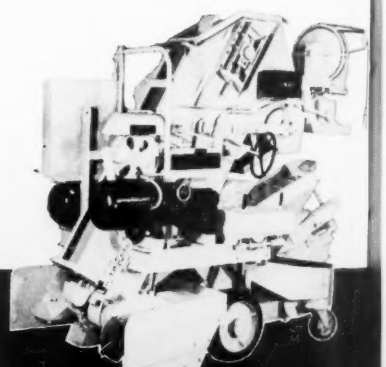
Here's where the new Magnarator fits into the B&P floor sand preparation line!







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A sand conditioning investment *proved* sound in thousands of foundries the world over. Built in three sizes with capacities of 750, 1000 and 1500 lbs. per minute, Screenarators provide thorough screening and complete aeration of any type of sand. Rugged, dependable . . . trouble-free performance assured with this *lowest* cost sand conditioner!

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Thoroughly foundry tested and approved, the Junior Nite-Gang is a high capacity, highly portable machine designed for use with a front end loader. With a capacity of up to 40 tons of sand per hour, the Junior Nite-Gang provides complete screening and aeration with magnetic separation. Four rubber-tired wheels assure easy movement through the foundry.

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Self-loading and power propelled, the Nite-Gang offers the ultimate in floor sand preparation. Shakeout sand is loaded directly from the floor, blended, magnetically separated, screened, doubly aerated and discharged directly into windrow or pile ready for molding. This one-man operated machine offers capacities of up to 50 tons of completely prepared molding sand per hour.

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(*Continued on page* 148)

The second meeting should emphasize questioning each work step in an operation and a review and discussion of projects submitted. The concluding session can be devoted to a thorough discussion of selling waste control ideas and putting them into effect.

At the second session Dean Van Order, Burnside Steel Foundry Co., Chicago, described methods that company used for establishing "Standards for Rough Chipping and Removing Welds." J. E. Hyland, John Deere Spreader Works, East Moline, Ill., was chairman and C. J. Pruett, McWane Cast Iron Pipe Co., Birmingham, was co-chairman.

Mr. Van Order stated that each operator in the cleaning department is equipped with an air grinder, electric grinder, chipping hammer and individual hoist. A meter at each station records the total time these tools are operating. A light hooked up in relay with the minute counter indicates to the operator and inspector that the equipment is working properly.

In establishing incentives, Mr. Van Order stated that because chipping is more fatiguing than grinding and because it builds up fewer minutes on the minute counter an additional allowance of 110 per cent is added to those jobs which must be cleaned entirely by chipping. For all other jobs on which pay is based on minute counter readings a 40 per cent allowance is made.

Establish Chipping Standards

The company's standards department however has been able to classify types of fin, length and thickness as well as burnt-on sand and scabs so standards have been established for their removal. The department keeps in touch with all questionable castings to decide which sand and fin allowance is needed and to see if the casting condition can be improved in the production department. Castings on which standards cannot be applied are treated as welded castings and payment is determined from the meter reading and a handling allowance.

Following castings through the cleaning room to determine their condition requires two to three hours a day by the timestudy engineer. Advantages for setting standards for rough chipping and removing welds are: Operators are rewarded in direct proportion to their individual effort; cleaning room foreman can control and allocate their backlog of work; actual direct chipping costs and weld removal costs per pound can be tied directly to the casting; progress on new operators can be seen at a glance and poor methods and costly operations can be detected easily and corrected.

Erwin G. Tetzlaff, Pelton Steel Casting Co., Milwaukee, concluded the meeting by describing the company's "Melt Department Incentive Plan." The plan consists of three parts: Quality—in which each melter-helper team is on a separate basis and offers the greatest opportunity for high incentive earnings; quantity—in which all melters and helpers share as a group; and power savings—which also are shared as a group.

Point value charts were set up for each type of steel produced. After each heat, the points earned by the melter and helper are recorded. The weekly total is divided by the total number of points possible to have been earned which gives the per cent of efficiency upon which the bonus is figured. The bonus is paid weekly.

The standard adopted was based on the average for a 6-month period and was found to be 3.66 man-hours per heat. The saving is shared with the company on a 75-25 split and the bonus is determined by dividing allowed hours into the product of 75 per cent times allowed hours minus actual hours.

Power savings are shared between employees and company on a 50-50 basis. Calculations revealed each kilowatt per heat saved should pay 0.075 per cent. Average power consumption was found to be 2130 kw per heat so the formula developed was 2130 kw less actual average kw per heat multiplied by 0.075 per cent.

MALLEABLE IRON

THREE sessions—one sponsored jointly with the Refractories Committee—and a roundtable luncheon comprised the Malleable Division's technical program. A report on the refractories session was given in the June issue. The second session, concerned largely with hot tearing of malleable iron, was presided over by W. K. Bock, National Malleable & Steel Castings Co., Cleveland, and F. B. Rote, Albion Malleable Iron Co., Albion, Mich.

The two papers presented at this meeting were prepared by E. A. Lange and R. W. Heine, University of Wisconsin. One, a progress report on an AFS-sponsored research project, described a test for hot tearing tendency which includes a testing machine and a test casting. The test was designed specifically for evaluating factors peculiar to white cast irons, but the authors believe it can be adapted to studies of other metals. In the white irons investigated, resistance to hot tear rupturing decreased with increasing percentage carbon in the iron. Temperature of hot tearing in the test casting was about 2030° F. The action occurred during eutectic freezing and while about the last 10 per cent or less of the metal was solidifying.

The authors recommended caution in interpreting test results in terms of foundry hot tear defects, and pointed out that carbon content of the iron is not the only factor influencing resistance to hot tearing. One reason for developing the test was to study the influence of melting furnace atmospheres on hot tearing characteristics of white irons. By employing the test it was discovered that high-carbon iron melted under one atmosphere may be stronger than low-carbon iron melted under another atmosphere. These results were reported in the session's second paper, which also covered furnace atmosphere's effect on fluidity, pinholing, mottling and chemical composition.

This study, a project of the division's Research Committee which is not yet completed, concerns metal properties produced by holding molten iron at 2700° F for one hour under atmospheres developed by carbon monoxide, carbon dioxide, nitrogen, water vapor, hydrogen and argon. All atmospheres except CO caused a decrease in metal fluidity, nitrogen being the most effective. Metal melted under hydrogen and water vapor atmospheres had extensive pinholing in the well of the fluidity casting, while these same atmospheres markedly increased the maximum percentage carbon permissible without occurrence of mottling. Hydrogen atmosphere increased resistance to hot tearing, and a CO atmosphere raised the minimum hot tear resistance encountered at 2.50-2.60 per cent carbon. Silicon and manganese losses were nil regardless of the atmosphere; carbon was lost rapidly under oxidizing atmospheres and slowly in a reducing atmosphere.

Opening discussion at the third malleable session, under the joint chairmanship of W. M. Albrecht, Chain Belt Co., Milwaukee, and P. F. Ulmer, Link-Belt Co., Indianapolis, concerned "Effect of Phosphorus Content on Graphitization Rate and

(*Continued on page* 155)

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More than 34 years' success in molten iron improvement.

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And besides conditioning iron for better castings, Famous Cornell Cupola Flux keeps cupolas cleaner and increases efficiency of operation. There is practically no bridging over and drops are cleaner. There is less erosion of brick or stone due to the glazed or vitrified surface which is formed on cupola lining.

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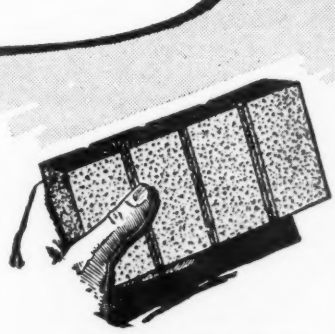

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(*Continued from page* 153)
Mechanical Properties of Black Heart Malleable Iron" and was presented by J. E. Rehder, Department of Mines and Technical Surveys, Ottawa, Canada.

With increasing use of duplex melting wherein large amounts of steel scrap, low in phosphorus, are used in the charge, phosphorus content of the finished iron of about 0.07 per cent became common. Questions of the effects of phosphorus in malleable iron became more important, since some control could now be had by additions of phosphorus. Mr. Rehder's paper is an attempt to evaluate the effects of phosphorus content in malleable iron and to determine whether there is an optimum phosphorus content.

With increasing phosphorus content the ultimate strength, yield strength and hardness increase, and elongation decreases. The ratio of yield to ultimate strength increases with phosphorus content. The unnotched and notched impact strengths are little affected up to 0.15 per cent phosphorus. The notched impact strength of heat treated (quenched and drawn) malleable iron decreases with increase in phosphorus content. The principal disadvantage of phosphorus in malleable iron would seem to be its action as a retardant of anneal.

Reduce Annealing Time

The second paper, "Malleable Iron Annealing Time Reduced," was prepared by W. G. Wilson and N. F. Tisdale Jr., Molybdenum Corp. of America, Pittsburgh. They covered in considerable detail the procedure in a number of experiments designed to show the effect of the addition of small amounts of boron to malleable iron. Conclusion drawn from the work is that since boron has enabled a much more rapid anneal under laboratory conditions, it should be possible to reduce the annealing time of the malleable iron in large commercial furnaces.

In the experiments the addition of approximately 0.0015 per cent boron to malleable iron reduced the annealing cycle for that iron in comparison to the annealing cycle used for the boron-free iron of the same base analysis.

In a written discussion, W. D. McMillan, metallurgist, International Harvester Co., McCormick Works, Chicago, quoted several former references to the effect that the time required to decompose carbides varies with section size and cooling rate and the basic factor is grain size. With a finer cell structure a greater number of graphite nodules develops than with a coarser grain metal.

J. H. Lansing, Malleable Founders' Society, Cleveland, presided at the division's roundtable luncheon. W. A. Kennedy, the Grinnell Co. Inc., Providence, R. I., served as co-chairman and discussion leader. In a paper on the subject of fluidity tests, presented by P. C. Rosenthal, University of Wisconsin, the speaker stated that fluidity is controlled by a number of variables—height of head, size of sprue, pouring speed, composition of mold, composition of metal, temperature, viscosity, surface tension, oxide films, inclusions, superheat. Freezing range is not the same for all metals. With the aid of slides the speaker described several methods for conducting fluidity tests and stressed the importance of conducting any series of tests under exactly similar conditions.

In the absence of P. C. DeBruyne, Moline Malleable Iron Co., St. Charles, Ill., his paper on dielectric core baking was presented by Chairman Lansing. Dielectric equipment adopted by the author's foundry use comprises two units which dry mostly small cores, although others range in weight up to 50 lb. Practically all cores are made on core blowing machines. Three grades of sand are utilized—light, medium and heavy. Up to the time of writing the paper the tube life of 5700 hours had exceeded expectation. In addition to drying the cores rapidly, the method has reduced broken core loss 50 per cent.

HEAT TRANSFER

HEAT transfer subjects were presented in two sessions, two papers being presented at each session. Dr. H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland, presided at both sessions. E. C. Troy, foundry engineer, Palmyra, N. J., was co-chairman at the first session, and W. S. Pellini, Naval Research Laboratory, Washington, was co-chairman at the second.

First paper, "Heat Flow in Moist Sand," a research progress report, was by Dr. Victor Paschkis, Columbia University, New York. Experimental work reported in this paper dealt with the determination of heat flow in sand containing 6 per cent moisture by weight. It is an extension of work performed last year on sand containing 4 per cent moisture. The same sands were used in each work.

Experiments showed that the conductivity-moisture curve flattens out with increasing moisture content. Furthermore, the amount of heat extracted from metal is not greatly influenced by moisture content. Difference of heat extraction between moist and dry sand is nominal after one minute. Consequently, while thin castings or thin parts of castings may be influenced by mold moisture content, the only effect on heavy castings is a change in solidification rate of metal near the surface.

In the discussion period, J. B. Caine, technical consultant, Cincinnati, stated that the chilling effect of wet sand sometimes causes hot tears. This is more true of thin sections than heavy sections, however.

"Solidification of Nodular Iron in Sand Molds," by R. P. Dunphy and W. S. Pellini, Naval Research Laboratory, Washington, was the second paper. It was presented by Mr. Dunphy.

Solidification of nodular iron occurs in three phases: Solidification of austenite dendrites beginning at the liquidus temperature and continuing to the temperature at which normal eutectic of flake graphite and austenite would occur. Suppression of normal flake graphite eutectic during which time graphite precipitates in a spherulitic mode from supersaturated interdendritic liquid. Solidification of remaining eutectic liquid as an austenite-iron carbide complex and malleabilization of the structure, resulting in growth of graphite particles. The number of nodules does not change during the eutectic solidification period.

The start and growth of dendrites during the time the growth is not influenced by eutectic reaction apparently is the same for gray and nodular iron. A difference after this point is in eutectic solidification. In gray iron the time interval between start and end of solidification is comparatively short, providing a narrow band of active eutectic solidification, denoting highly progressive solidification. Eutectic solidification of nodular iron occurs in a broad band fashion similar to the dendrite growth. The result is that time for complete solidification of nodular iron is longer than that for gray iron.

Effect of superheat on nodular iron is a progressive delay in the various solidification phases. Higher carbon equivalent shortens the time period between start and end of dendrite formation and lengthens time required for eutectic reaction. Effect

of seacoal addition to molding sand is a moderate decrease in solidification time.

First paper at the second session, "A Simplified Analysis of Riser Treatments," by C. M. Adams Jr., and H. F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass., was presented by Mr. Adams.

The speaker discussed methods of increasing riser efficiency. These include use of an inert radiation shield on top of the riser, an insulating sleeve surrounding the riser, exothermic material of the metal-producing type on top of a short riser, mildly exothermic or carbonaceous material on top of the riser, moldable exothermic sleeve surrounding the riser and heat applied externally by an electric arc or by induction.

Heat leaves the exposed upper surface of a riser by convection in the air and by radiation, and is transferred to the mold by conduction into the sand. Size and shape of risers and the type of metal poured affect the way in which heat is lost.

The official Dutch exchange paper, "Practical Consequences of Space, Time, and Temperature Relations During Casting of Metals," by J. S. Abcouwer, Werkspoor N. V., Amsterdam, Holland, concluded the heat transfer sessions. It was presented by Mr. Pellini.

The paper is a mathematical treatise of relations between variables and constant physical quantities as they effect temperature distribution during metal cooling. It gives formulas for calculating pouring time, ingates, risers, and heads for a casting starting from a successful geometrically similar one; formulas for computing the start and end of metal freezing, and a formula for dimensioning risers and heads.

CORE AND MOLDING SANDS

THE MANY aspects of core and molding sand preparation and use provided interesting discussions at five well attended technical meetings sponsored by the Sand Division. These were in addition to the four sessions of the Sand Shop Course.

Experimental research in application of olivine sand was described at the opening meeting by Gilbert S. Schaller, University of Washington, Seattle. Presiding were C. C. Sigerfoos, Michigan State College, East Lansing, and V. M. Rowell, Archer-Daniels-Midland Co., Cleveland.

Mr. Schaller said distinctive procedures have been found necessary to evaluate olivine molding sand aggregate, and predicted that introduction of olivine in the foundry will be characterized by misgivings and failures because the material will be expected to conform in its behavior to long established foundry practice.

Knowledge gained from tests indicates the potential of olivine sand aggregate as satisfactory for gray iron and nonferrous operation. The speaker said he had insufficient information to warrant definite conclusions as to steel castings as his steel melting facilities were inadequate.

Olivine grains can be made available in an extremely wide range of sizes. The smaller sizes, he said, have proved to be a splendid base sand for shell molds.

Articles on olivine sand research, in which Mr. Schaller participated, appeared in FOUNDRY, May and October, 1951.

John Sissener, Oslo, Norway, said that olivine has given good results as a molding material for steel castings, but it has not been proved that results are any better than with ordinary silica sand except for manganese and high-chromium steels to which olivine gives an excellent surface. Results in the use of this material in iron foundries in Norway are not convincing, he said. As for use in nonferrous foundries, so few tests have been made in his country that little can be concluded, he added.

Mr. Sissener spoke in connection with his presentation of the Norwegian exchange paper, "Practical Aspects of Olivine as a Molding Material," of which he and Bjorn Langum, A/S Myrens Verksted, Bentsbrought, Oslo, are co-authors.

Compared with silica sand, olivine has several drawbacks, as raw material for cores: (1) Olivine is heavier, thus core weight is considerably increased. (2) Oil sand cores made from olivine sand have less green strength. The core flows. Stronger reinforcements are necessary if the core can be made at all. (3) Drying of olivine sand cores takes more heat and a thorough drying takes more time. (4) Olivine sand cores retain the heat much longer.

(5) Organic binders in olivine sand cores do not burn to the same extent. When section thickness of the core is large in proportion to section thickness of the casting, the casting is apt to tear over the core when cooling, even if binder content has been reduced so much that green strength has reached its lowest limit. (6) It is more difficult to remove olivine sand cores from the castings, especially where section thickness of the castings is small.

"The Mechanism of Bonding in Foundry Molding Sands" was discussed in a study by L. M. Diran and H. F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass. Mr. Diran made the presentation. Study was a preliminary theoretical examination into the bonding action of clays in an attempt to see how far their characteristics might qualifiedly be described in terms of electrical forces.

Messrs. Diran and Taylor pointed out that while the subject might be too theoretical at present to attract widespread interest, it might very well, in five or ten years from now as studies progress, engage considerable attention among foundrymen.

Tested in Navy Yard

H. J. Williams, New Jersey Silica Sand Co., Millville, N. J., and Stanton Walker, National Industrial Sand Association, Washington, presided at the second sand session. In discussing "Mineral Perlite and its Use in the Foundry," E. D. Boyle described its use in research on gating and risering castings at Puget Sound Naval Shipyard, Bremerton, Wash., which he conducted with H. R. Wolfer, co-author of the paper.

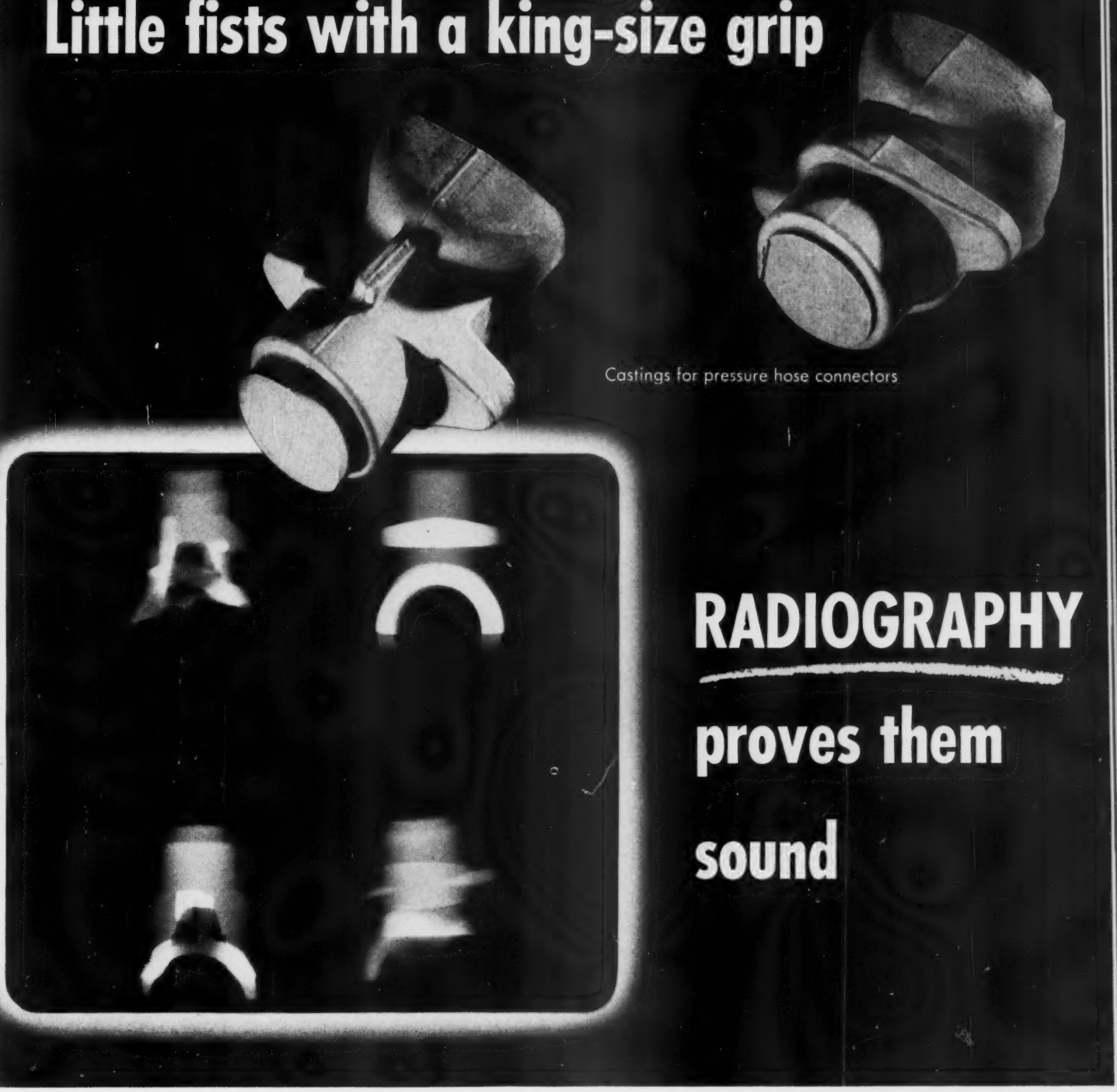
Perlite's insulation uses in the foundry include collars for risers, and as a riser cover; also as an addition to both molding and core sands. As a facing sand addition it is said to give good surface finish to castings, while in core sand mixtures it is claimed to give improved resistance to penetration and veining.

In the second paper, "Influence of Specimen Tube Loading and Riddle Size on Molding Sand Test Results," by D. I. Huizenga, Albion Malleable Iron Co., Albion, Mich., and K. E. Spray, U. S. Navy Bureau of Ships, Washington, Mr. Huizenga told of their investigations in an effort to eliminate discrepancies in testing procedures between foundry laboratories throughout the country. Thirteen foundry sands were used in collection of data, and efforts were made to achieve consistency in the testing.

Conclusions drawn included: Method employed in loading test tube had a negligible effect on test results. It was noted differences in test results of sand were a direct result of riddling of sands through No. 2, No. 4 and No. 8 riddles. All properties of sands showed some degree of variation. Weight of a standard sample

(Continued on page 160)

Little fists with a king-size grip



Castings for pressure hose connectors

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Machines of this design can be furnished through our entire range of Rollover machines from approximately 750 pounds capacity up to and including 40,000 pound rollover capacity at 80 pound air pressure.

The photograph illustrates the turnover plate and pattern being rolled back to their upright position. On reaching that position, the pattern clamps will be disengaged, the pattern removed from the machine, and taken back to the ramming station for another flask. Coreboxes are similarly handled.

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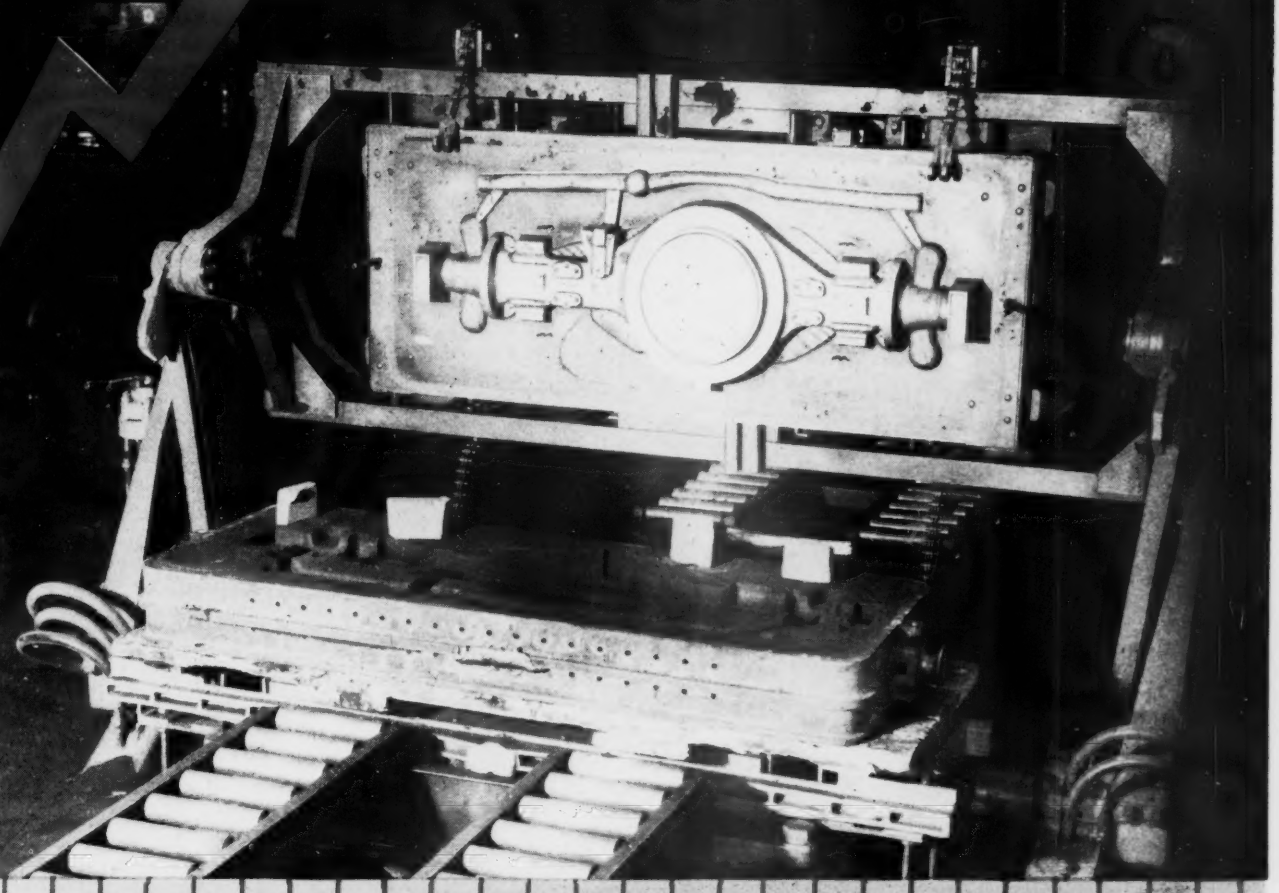


HERMAN MOLDING MACHINES

UNION BANK BUILDING, PITTSBURGH, PA.

(*Continued from page* 156)

tends to decrease and permeability tends to increase as screen openings per linear inch increase. No definite trends were observed for mold hardness and green compression strength. By statistical formulas it was proved that these differences were not due to chance, but were direct result of riddling sands through screens prior to testing.

Exchange paper from the Institute of Australian Foundrymen, "A study of the AFS Fineness Test," by H. A. Stephens, Commonwealth Scientific and Industrial Research Organization, Melbourne, was read by D. C. Williams, Ohio State University, Columbus. The paper, a critical survey of grading analysis for fineness, covered examination of various sources of errors in sieving, sampling, discrepancies in results for comparable sieves, and presented a method for calibrating unknown sieves using standard sands under standard conditions. AFS fineness number was discussed and a new distribution index was proposed.

Discussion of the second and third papers was combined and general opinion indicated that changes should be made in the fineness test. It was felt that AFS fineness numbers are of little value; sands should be identified by grain distribution, and in shell molding particularly, the AFS fineness number is not sufficient. With dry sand it is impossible to reproduce by test the same distribution as might be true with damp sand.

"Influence of Oven Atmosphere on Drying Molds and Baking Cores" was the title of a paper by Georges Ulmer and Maurice De Crop, Centre Technique des Industries de la Fonderi, Paris. It was presented by Mr. Ulmer at the third sand session, presided over by O. J. Myers, Archer-Daniels-Midland Co., Minneapolis, with W. G. Parker, General Electric Co., Elmira, N. Y., co-chairman.

Test results, according to the paper, showed that the influence of nature of atmosphere in which molds or cores are baked is secondary to the main factor, which is the temperature of the atmosphere.

Experimentation also revealed that, in core baking, sufficient oxygen for oxidation of the binder is always found in the atmosphere of any normal oven, "due to leaky joints." As for mold drying, an atmosphere of superheated steam is not more active than hot air mixed with fumes, but steam produces a regular and even drying which favors the production of a good mold, while reducing the formation of cracks.

A paper on the "Flowability of Foundry Sand" by Loris M. Diran, Ames J. Schaller and Howard F. Taylor, Massachusetts Institute of Technology, Cambrdige, Mass., was presented by Mr. Schaller.

Pointing out that no true index of flowability exists today whereby foundry sands can be dependably evaluated, the authors described work undertaken which might ultimately lead to a satisfactory set of standards.

Form Powder Grid

Strain studies, they explained, had been conducted in the past on metal powders. Deformable metal grids were used to determine the mechanisms by which these powders flowed when compressed in a die. A similar approach seemed indicated in the case of molding sands, but a new technique had to be developed, using grids formed by introducing lines of graphite into the sand specimens. The results of the strain analyses of cylindrical sand specifications were combined with compression-density data to study the flow-mechanism of molding sands.

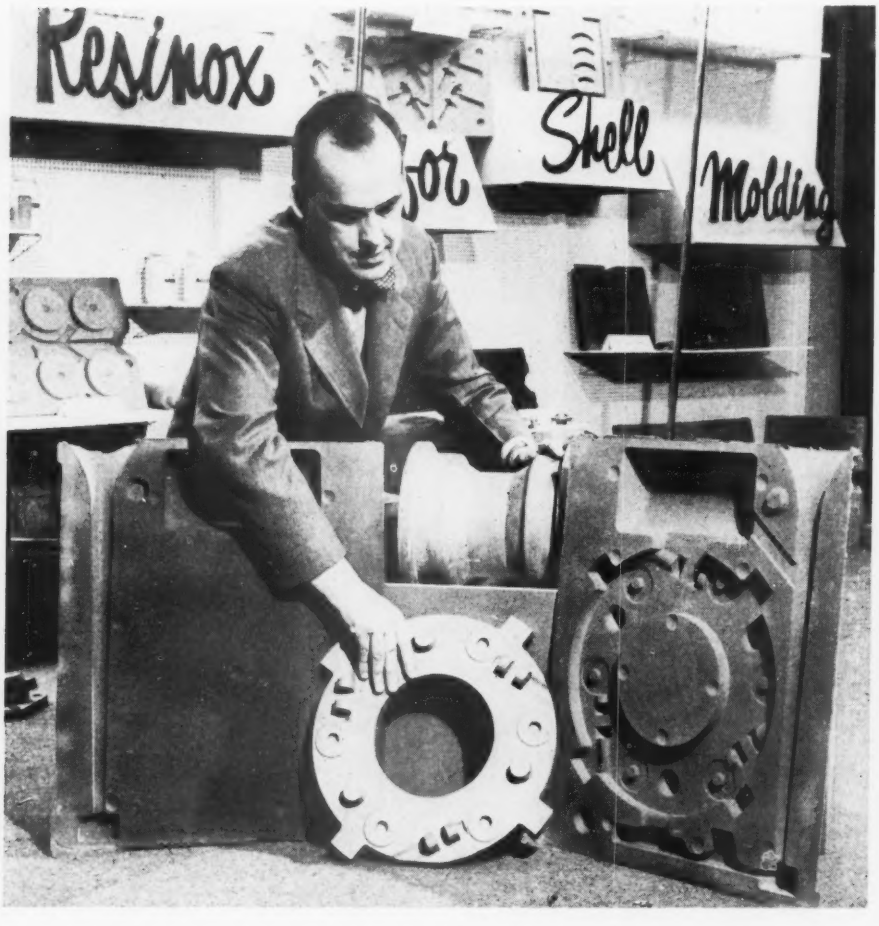
The deformation process, the authors revealed, is materially affected by the type of hydrated films about the sand grains, by the size distribution of the sand grains and by the method of loading.

Compressibility measurements show that the densification of foundry sands depends upon the deformation process. Molding sands of good flowability have low compressibility. Compressibility and "shear-angle" tests, based on the grid analyses, should prove to be practical test methods. Results have been obtained that are in excellent agreement with grid analysis results.

Official exchange paper from the Institute of British Foundryman and two papers discussing sand reclamation by pneumatic methods were presented at the fourth sand session. J. B. Caine, Wyoming, O., and Harry W. Dietert, Detroit, were meeting chairmen.

The British paper, entitled "Sand Control With Particular Reference

(*Continued on page* 164)



Walter Sokolosky, technical service engineer, Monsanto Chemical Co., examines two large castings made in shell molds. The roller under his left hand weighed 177 lb as cast and was made for tractor use by Lynchburg Foundry Co. within a 0.015-in. tolerance on a 10-in. diam. The lower casting, cast in the resin-sand molds on either side of it, is a clutch plate, also for tractor use

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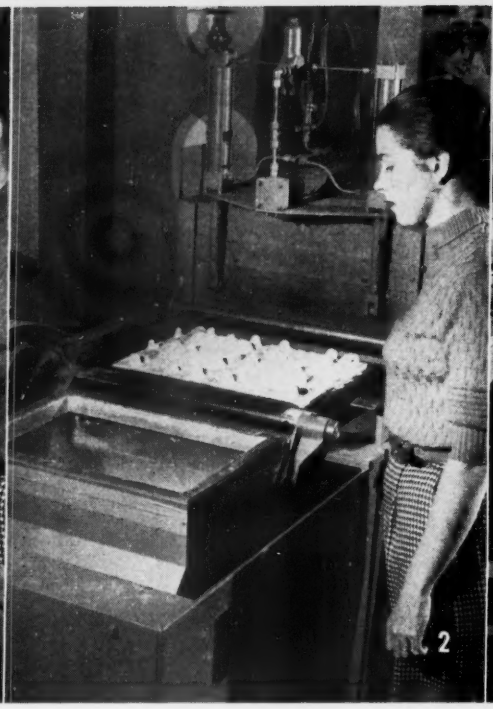
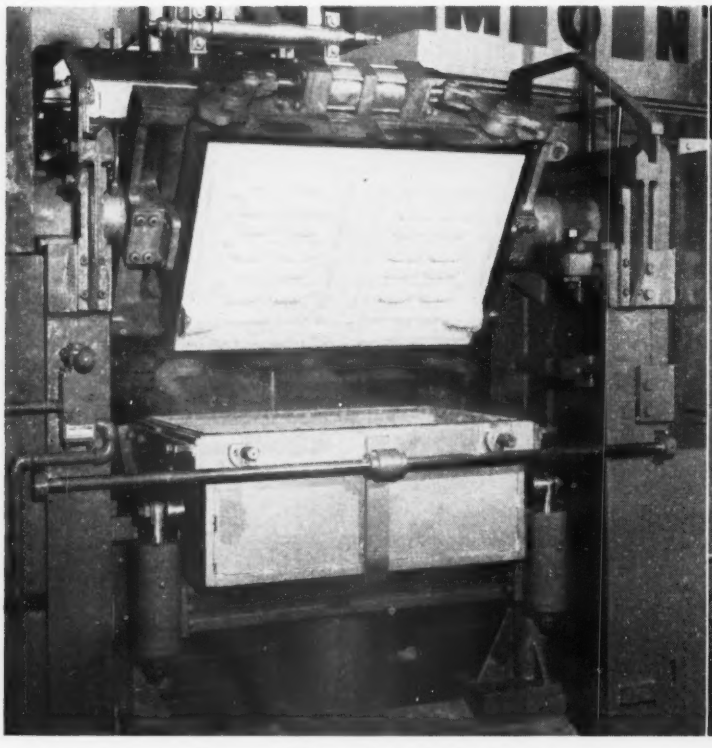
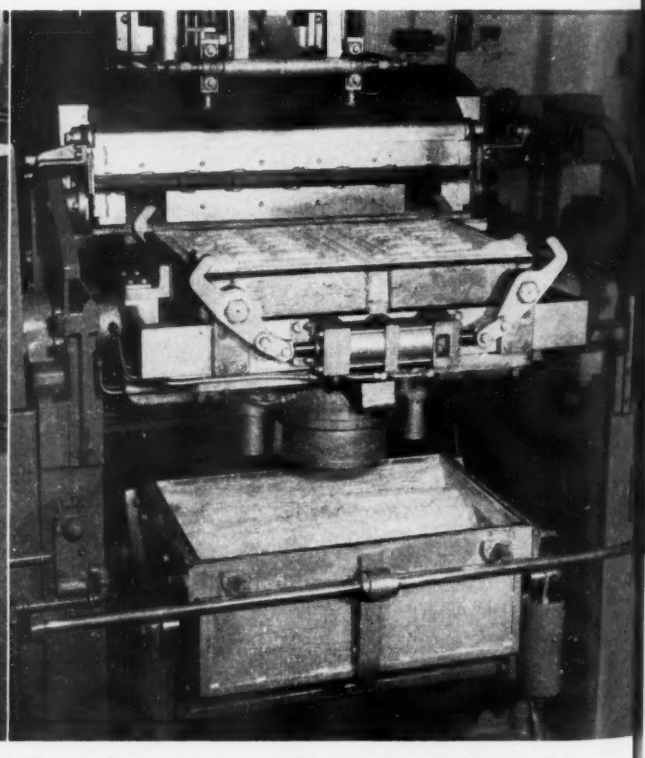


1. Shell molds incorporating resins produced by the Borden Co., New York, were made at that company's exhibit on an automatic machine built by the Shell-O-Matic Corp., a division of Newark Pattern Works, Newark, N. J. The unit comprises a dump box, rollover pattern mechanism, radiant heated curing oven and automatic shell ejector. Production models will incorporate strip heater pattern plates. Here the operator is spraying parting compound on the pattern plate. 2. Pattern plate swings over on top of the dump box; the box inverts and the pattern is invested with the resin-sand mix. After the box returns to an upright position the pattern plate with mold shell are ready to enter the infra-red radiant heat bake oven for cur-

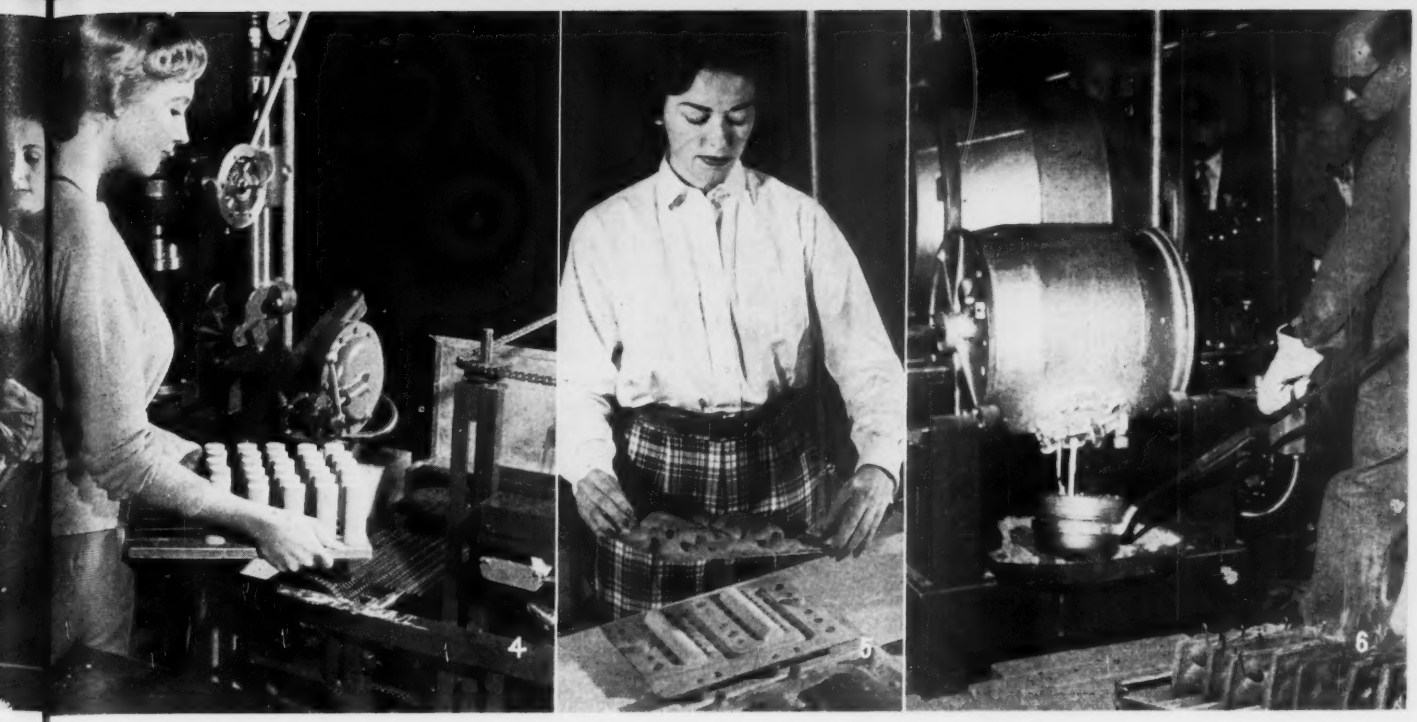
PRODUCING SHELL MOLDS

At the AFS Foundry Show

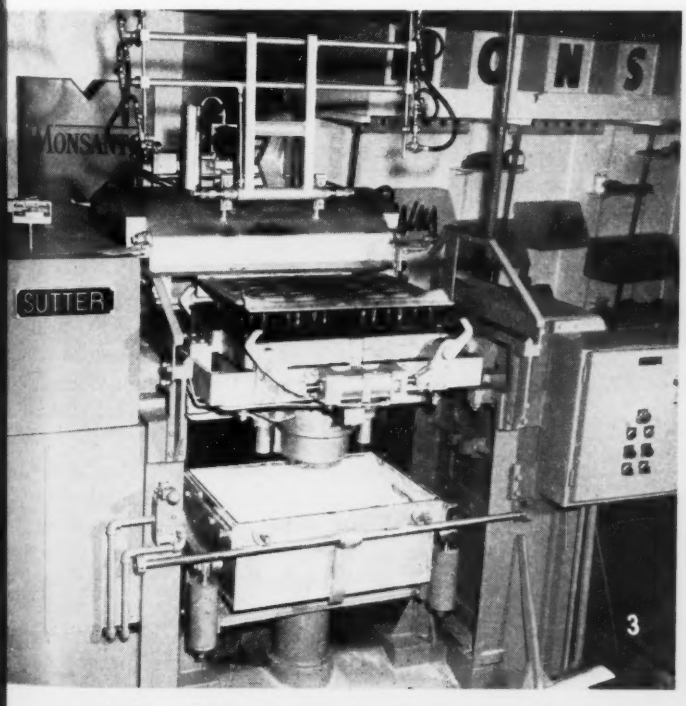




1. Exhibit of Monsanto Chemical Co., Everett, Mass., showing production of shell molds from sand mixture containing the company's phenolic resin. Automatic shell molding machine employed is manufactured by Sutter Products Co., Dearborn, Mich. A box containing the resin-sand mix is inverted with the pattern on



ing. 3. Operator lifts shell from pattern plate. Complete cycle takes about one minute. 4. Solid cores for insertion in the shell molds are made on bench type blower from mix containing plastic core binder. Here a tray of cores is placed on conveyor of infra-red radiant heat oven for baking. 5. After cores are placed in one of the mold halves, glue is applied to other half and the two sections are joined and clamped. Adhesive dries in about 30 seconds. 6. Pouring molten steel into shell molds, which are not supported by shot or other backing material. Metal was furnished by an electric furnace operated by Detroit Electric Furnace Division, Kuhlman Electric Co., Bay City, Mich., co-sponsor of the exhibit.



top before the box returns to the position shown here. A thin sand-resin shell adheres to the pattern. 2. Curing oven in background moves forward over the shell to complete the curing of the mold. 3. Following curing stripper pins lift the shell from the pattern, completing the machine's automatic cycle. Production was at a rate of 45 molds an hour. 4. Two halves of the finished mold are examined by Ray H. Sutter (left), president, Sutter Products Co., and E. S. Bauer, industrial resins sales manager, Monsanto Chemical Co.

(*Continued from page* 160)
to the Prevention of Scabbing," was given by W. B. Parkes, British Cast Iron Research Association. It discusses that type of scab frequently known as expansion scab. Mr. Parkes' paper was based on results of tests in which castings were produced to determine the effect of the addition of various materials to the sand to prevent scabbing. These tests were conducted with the assistance of a special device which determines with considerable accuracy the deformation of molding sand and a stress-strain curve. It permits sand specimens to be raised in temperature to 1830° F within 60 seconds.

Tests showed that, in the absence of additive materials which become liquid or plastic, the tendency of a particular sand to scab can be related with the stress-strain curve of the dried sand at room temperature as follows:

If deformation at maximum stress is low and the test piece fails rapidly once maximum stress is reached, the sand will scab readily.

If deformation is high and, after maximum stress has been reached, a test piece continues to deform under a slowly decreasing load, the sand will not scab.

A paper on pneumatic reclamation of foundry sands was presented by Clifford E. Wenninger, director, foundry Research & Development, University of Kentucky, and field development engineer, National Engineering Co., Chicago. Mr. Wenninger described the equipment this company has developed for reclaiming foundry sand by impinging the sand grains under air pressure against a conical target which holds a certain mass of sand within its peak.

The sand grain impingement removes adhering carbonaceous and bond materials. Pneumatic reclamation has been found most efficient and economical in reclaiming round grain base sands of the Ottawa type. It is least efficient or economical with some of the lake sands with a high percentage of sub-angular grains in their make-up. The first commercial installation of the equipment showed costs for operation of slightly under $1 per ton of sand. This includes cost of one full-time operator, which can be eliminated by installation of a pneumatic elevator, thereby reducing the cost per ton to below 67 cents.

The second paper on reclaiming sand, entitled "Reclaiming Used Molding Sand by Air Scrubbing," was presented by H. H. Fairfield, William Kennedy & Sons Ltd., Owen Sound, Ont., Canada. Mr. Fairfield was co-author of the paper with James McConachie and H. F. Graham of the same company. The scrubbing unit developed by this company consists essentially of a 4-in. diameter cylinder approximately 6 ft tall into which the sand is blown by compressed air at the base. Fines and dust are separated from the top of the cylinder and the cleaned sand drops through a side pipe. Slag, iron and other large foreign objects drop to the bottom of the cleaning chamber and are removed periodically. The unit operates continuously, reclaiming 150 to 200 pounds of sand per hour.

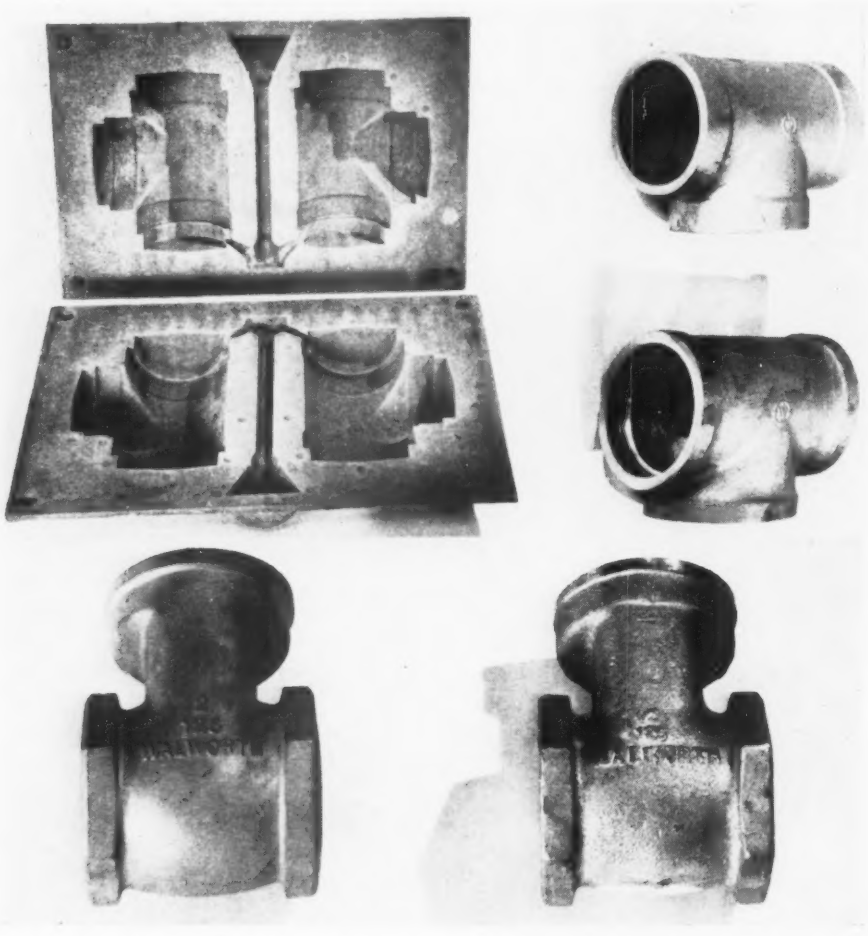


Exhibit of the Bakelite Co., New York, included various couplings, valves and fittings cast in shell molds by the Walworth Co., South Boston, Mass. The 4-in. tee coupling at right above was cast in a shell mold to tolerance of 0.003 to 0.004-in. Below it is a similar casting made in green sand. Good surface finish of a 3-in. gate valve body cast in a shell mold (bottom left) minimizes finishing operations. Same part cast in green sand shown at right

Use Reclaimed Sand Regularly

The reclaimed sand has been used regularly in molding and core sand mixtures. Surfaces of castings were identical to those castings made in new sand mixtures. It was found, however, that to reclaim a sand for use as core sand, the amount of work performed on the sand must be two or three times that required for molding sand.

The concluding sand session program included progress reports by two committees concerned with sand properties at elevated temperatures. Harry W. Dietert, Detroit, and Elmer C. Zirzow, Werner G. Smith Inc., Cleveland, presided.

Victor M. Rowell, Archer-Daniels-Midland Co., Cleveland and chairman of Committee 8-J discussed "Veining Tendencies of Cores." His committee has established that the veining defects can be produced or eliminated by selection of base sands, binders, metal pouring temperature, degree of ramming, degree of baking, percentage of binders and, in some cases, moisture. Early work appeared to indicate that a good correlation could be expected between expansion and collapse time of the cores, and veining. However, too many exceptions were found. So far no tests have been discovered which will enable the foundryman to predict the veining

(*Continued on page* 166)

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(*Continued from page* 164)
tendencies of cores with certainty.

A progress report on steel sands at elevated temperatures, prepared by R. G. Thorpe, A. E. Riccardo, T. L. Widener and T. E. Kyle, Cornell University, was presented by Mr. Thorpe. Pointing out that both expansion and deformation must be considered in sand performance, Mr. Thorpe showed stress-strain curves of bentonite and fire clay bonded sands at different temperatures. Incidence to scabbing is greater in the fire clay bonded sand than that of the bentonite. Scabbing likewise increased as the bentonite content was reduced from 4 per cent.

A comprehensive study of the effect of binders and additives on ductility in molding sands at elevated temperatures was described by R. E. Morey, Naval Research Laboratory, Washington. Mr. Morey co-authored the paper with C. G. Ackerlind and W. S. Pellini of the laboratory. In this study, use was made of equipment which incorporates a device for continuous recording of stress-strain diagrams to form permanent records.

The resulting charts demonstrate what additions to make to the sand to develop maximum strength, modulus of elasticity and deformation at the desired temperature. In the different tests, the following materials were added, in addition to 4 per cent western bentonite in each case: corn flour, wood flour, asbestos fiber, seacoal, iron oxide, and silica flour. By superimposing the resulting stress-strain diagrams for each of the additions, the comparative strength, modulus of elasticity and deformation at different temperatures are indicated.

In connection with sand testing by individual foundries, J. B. Caine pointed out that an AFS test casting committee is being organized in the Sand Division in an attempt to standardize the types of castings used in such test work. He suggested that foundries intending to initiate test work get in touch with the committee before selecting a type of casting for its experimental operations.

EDUCATION

PROBLEMS of creating youth interest in the foundry industry and of training young foundrymen came in for considerable discussion during the two technical sessions and dinner meeting sponsored by the Educational Division.

Because much of the work of this division must originate in educational activities of the individual AFS chapters, two sessions were devoted to what various chapters have accomplished through their educational committees and how their programs can be adopted by other chapters. These sessions were presided over by Fred G. Sefing, International Nickel Co., New York, and Edwin W. Horlebein, Gibson & Kirk Co., Baltimore.

Undoubtedly the most comprehensive attempt by an individual chapter to sell the foundry industry to the public has been the long-range program instituted by Northwestern Pennsylvania Chapter about six years ago. As described by the chapter's education chairman, Earl M. Strick, Erie Malleable Iron Co., Erie, Pa., this work has included such features as a week-long foundry show which attracted over 10,000; an advertising program in local newspapers; preparation and distribution to high school boys in the area of 10,000 booklets entitled "Your Future in the Foundry," and presentation of talks, movies and literature describing the foundry industry to students and civic groups.

The most recent educational activity of the Erie group is the production of a narrated slide film, the initial showing of which was made by Mr. Strick at the Atlantic City meeting. This film, entitled "A Career in Metal" and made to the highest professional standards, is a 30-minute presentation forcefully portraying the advantages of the modern foundry industry as a career for young men and women. With varying introductions it is adapted for showing before professional and civic clubs, women and parent-teacher groups, and young people. The chapter plans to make the film available for purchase by other chapters and foundry organizations, and information concerning it is obtainable through Mr. Strick, 629 Beverly Drive, Erie, Pa.

Describing educational work of the Philadelphia Chapter, A. N. Kraft, Wilkening Mfg. Co., emphasized the need for a long-range program, with committee members serving two to three years. He also recommended a survey of chapter members' opinions in attempting to set up lecture courses. Philadelphia Chapter has had greater success with intensive two or three day lecture courses than with an extended series of 12 to 20 lectures.

Robert Gregg, Reliance Regulator Division, American Meter Co., Alhambra, Calif., described lecture programs sponsored by Southern California Chapter, including one for foundrymen, engineers and purchasing agents. Saturday morning courses in individual foundries were found best for apprentice training. A short practical sand school met with considerable success, while a prize essay contest for engineering college and trade school students likewise attracted much interest.

Needs Management's Interest

The second educational session was conducted by Prof. George J. Barker, University of Wisconsin, and W. J. Hebard, Continental Foundry & Machine Co., East Chicago, Ind. Discussing "Management's Responsibility in the Training Program," J. D. Judge, Hamilton Foundry & Machine Co., Hamilton, O., pointed out that while an important reason for training is to insure a continuation of the business, human considerations cannot be ignored. This means that management should be interested in the type of all-around training its community schools afford pupils; it should also be concerned with other factors affecting the well being of the employee, not merely with those circumstances directly concerned with the individual's job.

Maurice C. Sandes, Mare Island Naval Shipyard, Vallejo, Calif., in a paper, "Apprentice Training—It is Needed," maintained that the trend toward foundry mechanization has not removed the need for journeymen molders and coremakers who can handle intricate and large molding problems. He said that apprentice training is the answer to the problem of skilled labor shortages, and made the following recommendations:

All local industries should determine the need for vocation-technical training; determine the facilities available for training; plan, develop and conduct training programs; organize instructional material; secure and keep competent teacher-instructors; publicize the program.

The Educational Division program was concluded with a well attended International Education dinner, presided over by I. R. Wagner, AFS vice president, and Collins L. Carter, vice president-elect. The fact that the foundry industry has common problems in both the United States and Great Britain in the matter of recruitment and training was indicated in two most interesting talks by the

(*Continued on page* 170)

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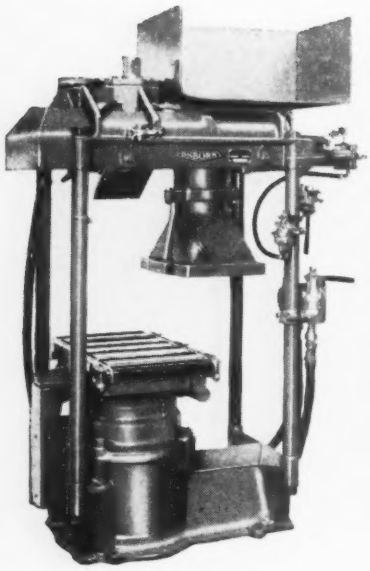
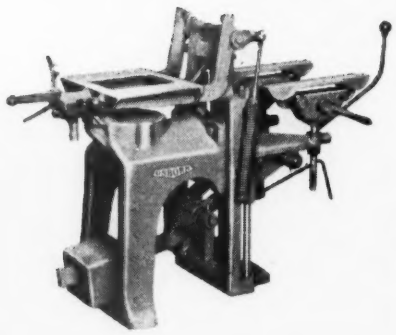
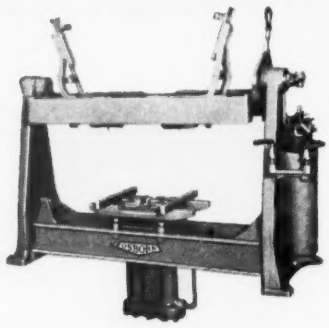


Draw Piston Type

Diaphragm Type



Hand Operated Rockover Core Machine



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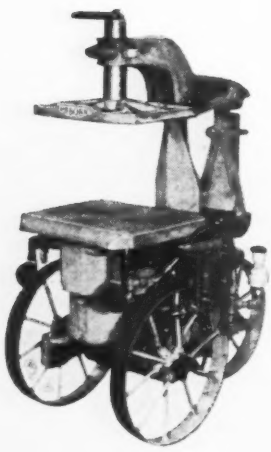

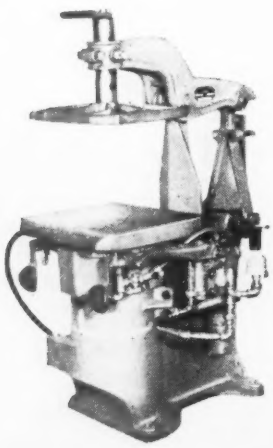

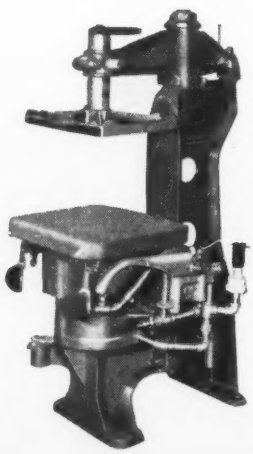

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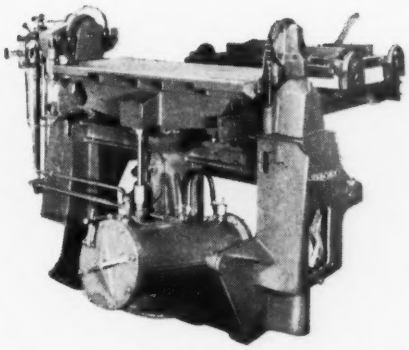

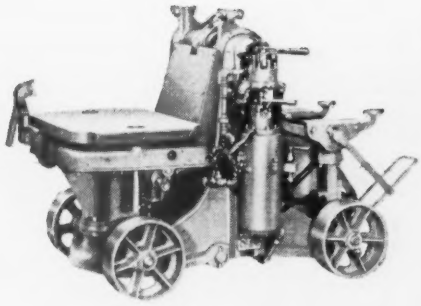

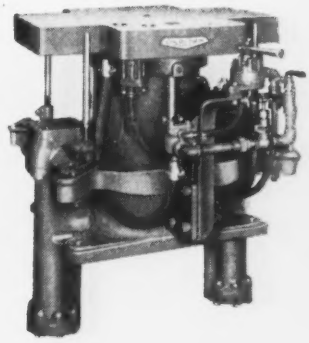

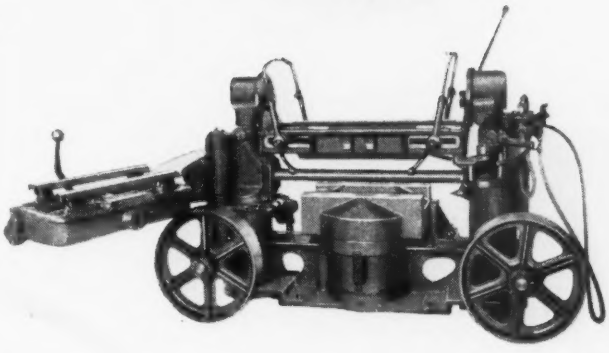

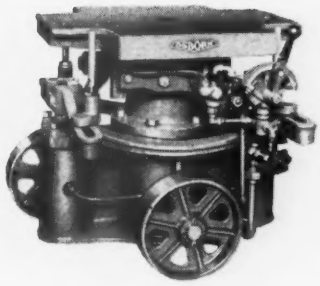

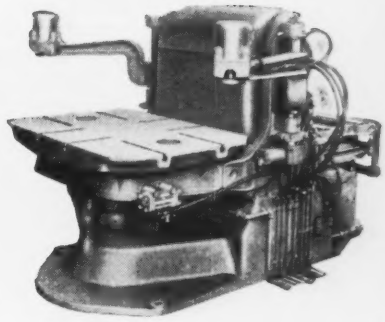

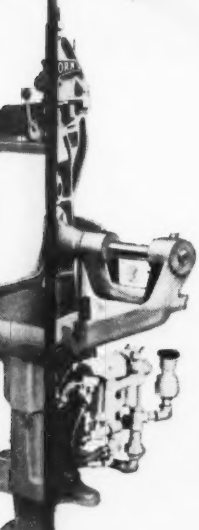

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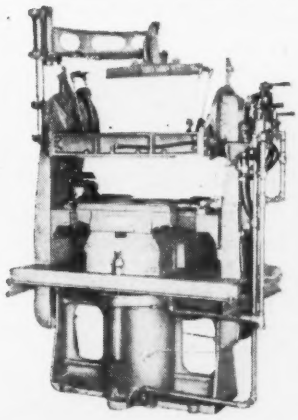

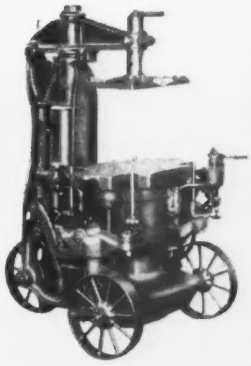

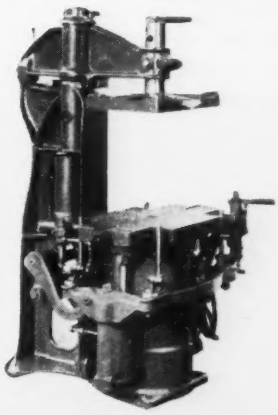

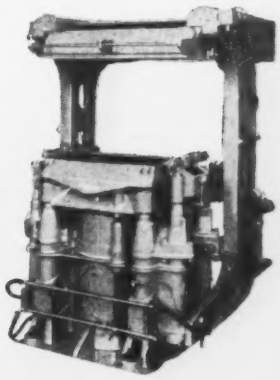

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(*Continued from page* 166)
principal speakers—Noel P. Newman, Newman Hender & Co., Gloucester, past president, Institute of British Foundrymen, and Tom Makemson, secretary, IBF.

The speakers described some of the efforts of British foundry organizations to interest young men in the industry. They also discussed training programs for apprentices and for men seeking to advance to supervisory positions, and activities of the National Foundry College.

STEEL CASTINGS

ACTIVITIES of the Steel Division were centered in five technical sessions over three days, winding up with a roundtable luncheon meeting the final day. Subjects of papers covered boron substitution for alloys, use of chills to increase feeding, hot tears, statistical quality control, desulphurization with injected carbide, and cutting with high-purity oxygen.

Initial session was presided over by C. B. Jenni, General Steel Castings Corp., Eddystone, Pa., with Dale Hall, Oklahoma Steel Castings Co., Tulsa Okla., as co-chairman. In the first paper, "Substitution of Boron for Alloys in Cast Steels," contributed by Ray A. Dyke Jr., metallurgical assistant, and C. K. Donoho, chief metallurgist, American Cast Iron Pipe Co., Birmingham, Ala., and presented by the latter, it was shown that boron substantially increases hardenability in carbon and low-alloy compositions essentially as it does in wrought steels.

With tempering temperatures as high as 1200° F, however, effect of boron is largely lost. "Fading" of boron, it was stated, has not been found to be a serious problem with normal precautions. Effect of boron on mechanical properties is about what would be expected from the hardenability increase.

"Application of Chills To Increasing the Feeding Range of Risers" was a paper prepared by E. T. Myskowski, H. F. Bishop and W. S. Pellini, Naval Research Laboratory, Washington, and presented by Mr. Bishop. The length of steel plate and bar castings which can be made sound when directional solidification is aided by use of adequate steel chills has been determined radiographically and related to the thermal gradient conditions in both the castings and chill.

It was found that for steels containing 0.25 to 0.35 per cent carbon the maximum distance in inches (D) which can be made sound with one riser follows the empirical rules given by the formulas D (plates) = $4\frac{1}{2}T$ + 2 in. and D (Bars) = $6\sqrt{T}+T$ where T = casting thickness. Chills placed between risers promote soundness for a distance equal to 2 D (1 D in each riser direction).

Hot tearing was the subject for the second steel session at which R. H. Jacoby, Key Co., St., Louis, presided, and R. H. Frank, Bonney-Floyd Co., Columbus, O., was co-chairman. First paper dealt with "Metallurgy and Mechanics of Hot Tearing." It was contributed by H. F. Bishop, and C. G. Ackerlind and W. S. Pellini, Naval Research Laboratory, and presented by Mr. Pellini.

One of the most common and serious defects encountered in castings, hot tearing is particularly difficult to control inasmuch as it involves an interaction of mechanical and metallurgical factors. In their investigation, the authors determined solidification conditions at the time of hot tearing through use of simultaneous radiography and thermal analysis of solidifying castings. It was established that hot tearing occurs at near solidus temperatures, at which state solidification is essentially complete except for liquid films.

Corollary strength tests coupled with thermal analysis to establish the state of solidification at the time of the tests showed that the development of high strength followed immediately upon the elimination of film region.

This paper presented a new generalized theory of the mechanism of hot tearing. In the light of their analyses, the authors stated that effect of pouring temperature should be considered highly specific to the type of casting in question. This conclusion is based on the variety of possible effects from pouring temperature on the nature and extent of the hot spot and contraction condition resulting from simple modification of gating and risering methods.

Second paper was titled "Hot-Tear Formations in Steel Castings," and authored by U. K. Bhattacharya, C. M. Adams and H. F. Taylor, Massachusetts Institute of Technology. Presentation was by Mr. Bhattacharya.

The authors pointed out that it is difficult to prevent systematically the occurrence of hot tearing in a complex casting because so little is known about solidification mechanism in a mold. In the research they conducted, tearing was produced in a flanged casting by placing restraining bars between the flanges. The degree of restraint was controlled by means of a gap in the bar. Apparatus was devised to detect the time and temperature at which cracking initiates in the casting.

In mild steel killed with 0.10 per cent aluminum, the tearing temperatures were reported as between 2475 and 2510° F. The linear contraction measured 0.91 to slightly less than 0.60 per cent, respectively. The steel became sufficiently strong below 2475° F to resist tearing by the contraction stresses. Silicon—deoxidized steel castings failed at lower temperatures, indicating a greater susceptibility to hot tearing. An addition of 0.05 per cent aluminum was required in the case of high-sulphur steel (S= 0.05 per cent) to recover hot-tear resistance.

Limited investigations conducted on medium-carbon steel (0.49 per cent C) indicated that steel of this composition would not tear below 2400° F under any of the conditions imposed by the authors' experiment.

Investigate Hot Tears

Third paper at this session, "Investigation of Hot Tears in Steel Castings," constituted a research progress report of the Steel Division Research Committee. The report was in three parts. In Part I, Gordon W. Johnson, Armour Research Foundation, Chicago, dealt with the "Test Specimen for Evaluating Hot Tearing." In Part II, G. A. Lilleqvist and J. H. Fuqua, American Steel Foundries, East Chicago, Ind., made an "Evaluation of Hot Tear Test Casting." John A. Rassenfoss, research metallurgist of the same company, made the presentation. Part III constituted a report of the "Hot Tear Investigation" and was prepared by C. H. Wyman, C. A. Faist and George Di Sylvestro, Burnside Steel Foundry Co., Chicago. Mr. Wyman, chairman of the Research Committee, presented this report.

Primary conclusions arrived at are that the Armour Research test casting furnishes reproducible results and that these castings are sensitive to variation in conditions. Secondary conclusions are: Hot tear incidence is directly related to the degree of hot spot concentration; variation of hot tear incidence between two cylinders made from cores of similar

(*Continued on page* 172)

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(*Continued from page* 170)

core mix is directly related to differential density of cores which metal surrounds; hot tear incidence is apparently affected by various metallurgical factors; hot tear incidence is directly related to the properties of individual core mixes; and pouring rate variations has no effect on hot tear incidence for this particular design test casting.

Mr. Wyman emphasized that the conclusions are based entirely upon test data taken for the Armour Research test casting design and stressed that different conditions would be presented by a casting of different shape, weight or design. However, it was shown that certain basic factors concerning various core mixtures appear to influence the degree of hot tear incidence.

Statistical quality control provided the topic for two sessions of the Steel Division. First of these sessions had to do with the general aspects of the method and the second with applications in foundries.

At the initial session, H. H. Johnson, National Malleable & Steel Castings Co., Sharon, Pa., presided, and R. W. Gardner, Dearborn Iron Foundry, Ford Motor Co., Dearborn, Mich., was co-chairman. First paper, "The Whys and Wherefors of Statistical Quality Control," was presented by W. R. Weaver, director, steel conservation and quality control, Republic Steel Corp., Cleveland, and also president, American Society for Quality Control.

Quality control does not replace anything, Mr. Weaver declared; rather it is a sound supplement to present methods. Use of this system will sharpen up judgment by providing facts instead of opinions. It aids in obtaining the correct answers to highly complex industrial problems and in so doing saves time, energy and mistakes. One of its strong points, he continued, is that it tells what action is needed, and, of even greater importance, when not to take action.

In the second paper, E. L. Fay, quality control advisor, Deere & Co., Moline, Ill., spoke on "Foundry Management Looks at Statistical Quality Control." In presenting the case for the system, he first pointed out its value to the foundry manager in controlling and increasing quality, in reducing scrap and salvage costs and in the indirect and secondary benefits to be derived from such a program. Second, he discussed several of the fundamental steps in setting up a successful quality control propram, and third, he pointed out briefly some of the results.

In his conclusions, Mr. Fay emphasized that statistical quality control not only gives a mathematically correct picture of process quality and process variability, but it is easy to undersand and simple in its application. It can be installed without disrupting current routine and schedules, the speaker stated.

A point brought out forcibly in the discussion period was that quality control is just as important for small shops as large. It will save money, even where production is short runs. It was revealed also that personnel to handle quality control usually is obtained from the inspection department.

At the fourth steel session, which continued the consideration of statistical quality control, A. A. Evans, International Harvester Co., Indianapolis, presided, and George Ver Beke, John Deere Malleable Iron Works, Moline, Ill., was co-chairman. "Quality Control in a Malleable Iron Foundry" was the title of a paper contributed by E. F. Price, chief inspector, and O. K. Hunsaker, assistant superintendent, Dayton Malleable Iron Co., Ironton, O., and presented by the former.

Major portion of the authors' presentation was devoted to a description of procedure in collecting data and preparing charts. The conclusion stated that since statistical quality control is not new and its success in manufacturing applications is well known, its value in foundry applications should come as no surprise. The method is not a cure-all which will make good operations out of bad ones, or good castings out of bad castings, but the charts will indicate when action should be taken to correct an operation or repair a piece of equipment. The charts merely indicate, they do not do the work of correcting. Success of the quality control program, it was asserted, de-

(*Continued on page* 174)

INTERNATIONAL GOOD WILL: Foundry Equipment Manufacturer's Association was honored at Atlantic City, May 3, when it was presented a beautiful cast bronze plaque by the Italian Foundry Equipment and Supplies Association as a token of friendship and esteem. Presentation was made by Mario Olivo, president of the Italian group. Shown at the ceremony, left to right, are W. B. Wallis, Pittsburgh Lectromelt Furnace Corp., Pittsburgh; Thomas Kaveny Jr., Herman Pneumatic Machine Co., Pittsburgh; V. F. Stine, Pangborn Corp., Hagerstown, Md.; A. J. Tuscany, FEMA executive secretary; Leon Miller, Osborn Mfg. Co., Cleveland; C. V. Nass, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago; Aubrey Grindle, Grindle Corp., Markham, Ill.; Mr. Olivo; Wayne Belden, Ajax Flexible Coupling Co., Westfield, N. Y.; secretary to Mr. Olivo; E. A. Borch, National Metal Abrasive Co., Cleveland; D. E. Davidson, Link-Belt Co., Chicago. (Photo by I. H. Dennen, Beardsley & Piper)

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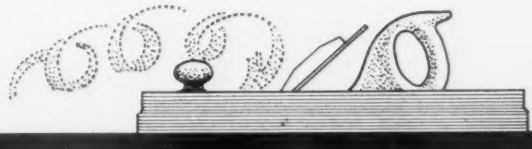

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(*Continued from page* 172)

pends upon four factors: Collecting the proper data, relaying the data to the proper authority for action; prompt action as a result of this information; and close co-operation among all members of the organization.

"Quality Control in a Jobbing Steel Foundry" was the second paper at this session, authored by H. H. Fairfield, chief metallurgist, William Kennedy & Sons Ltd., Owen Sound, Ont. This foundry produces castings from 1 lb to 5 tons in weight from carbon, alloy and manganese steels. There are no long production runs, most orders ranging from one to six pieces.

Set Up Control Program

Mr. Fairfield described the steps in setting up a quality control program. The first was to post all chemical tests, physical tests, melting times and down times on charts. This enabled melters to study results of their efforts. Second step was to initiate standard statistical quality control charts for physical test results and some chemical tests. This permitted the metallurgist to detect "assignable causes" of variation. Third step was to post a scoreboard at the electric furnaces and to rate each melter by the percentage of perfect heats made.

Frequency of assignable causes has dropped from 30 to less than 7 per cent and further improvement is hoped for. The melting process is not under control in the statistical sense; however, it is tending in that direction.

Since production runs are short, it is not possible to set up charts for individual castings, Mr. Fairfield explained. Furthermore, quality control methods. have not yet been applied to sand mixes.

Fifth steel session featured papers on desulphurization with injected carbide and cutting with high-purity oxygen. C. H. Lorig, Battelle Memorial Institute, Columbus, O., presided, and Charles Locke, Atlas Foundry & Machine Co., Tacoma, Wash., was co-chairman. E. C. Troy, consultant, Palmyra, N. J., served as recorder.

In the first paper, titled "Steel Desulphurization with Injected Carbide," S. F. Carter, American Cast Iron Pipe Co., Birmingham, described a method that has reduced sulphur in small acid electric heats from 0.085 to 0.045 per cent, 0.075 to 0.038 per cent, 0.030 to 0.019 per cent, and the like. Sulphur removal in basic heats also has been accelerated by the same treatment. The method involves the injection of fine carbide into the furnace bath with inert gas, and the experimentation was on production heats.

Desulphurization is accomplished with fine calcium carbide blown under the surface of the metal bath with the pressure of inert gas. The steel must be in proper deoxidized condition and slags high in silica and iron oxide must be removed. The treatment, the speaker continued, adds some material costs and some additional operations to acid melting practice, but it is not noticeably destructive to refractories and apparently not detrimental to fine steel quality. The additional cost appears to be equal to or less than the cost of basic electric double-slag practices accomplishing comparable desulphurization, epsecially when needed only intermittently. Carbon dioxide gas is used to inject the carbide.

The second paper, authored by E. H. Roper, Air Reduction Sales Co., and J. F. Kiernan, Air Reduction Laboratories, Air Reduction Co. Inc., New York, and presented by the former, was titled "Cutting with Ultra-High Purity Oxygen." It described experiments made to determine effects of oxygen purities between 99.0 and 99.83 per cent on cutting and starting of cuts on steel plate, billets and cast steel sections. Contrary to earlier investigations, the new studies show a straight-line relation between oxygen purity and cutting efficiency for the region explored in an extended test.

In general, the authors stated, the rate of gain between the purities mentioned is about 2 per cent increase in speed for each 0.1 per cent increase in purity. Starting times were independent of purity in the range tested.

Activities of the Steel Division were concluded with a roundtable luncheon at the Ambassador Hotel, May 7. V. E. Zang, Unitcast Corp., Toledo, O., presided and conducted the informal discussion on a wide variety of steel foundry problems. Immediately, however, the problem of hot tears came up and there all conversation remained pegged until adjournment.

One of the questions batted around was as to the effect various sulphide inclusions have on hot tearing. It was agreed that the sulphide chain type are the worst; however, the tears can occur with any type. The tearing apparently takes place through the liquid medium, and among factors exerting an influence are design of the casting and manner in which freezing occurs.

Some research work done in Canada was mentioned. In this a casting was intentionally designed to produce hot tearing. A conclusion arrived at was that the tendency to hot tear is attributed 95 per cent to design and molding technique and only 5 per cent to variables in the metal. It was emphasized, however, that this is merely a tentative conclusion.

PLANT EQUIPMENT

PLANT and plant equipment discussions were held at two sessions. Four papers and one motion picture were presented. James Thomson, Continental Foundry & Machine Co., East Chicago, Ind., presided at the first session, with R. J. Wolf, Stone & Webster Engineering Corp., Boston, as co-chairman.

First paper, entitled "Development and Application of Molding Machines for the Production of Light Castings," was presented by A. S. Hedberg, Wells Mfg. Co., Skokie, Ill. Mr. Hedberg outlined the history of molding machine development from the time of the first machine in 1800 and the first dependable machine in 1837 to the various types offered today.

Concluding paper at the first session, "Development and Application of Machines for the Making of Molds by Slinging," was by Martin Putz, Mattison Machine Works, Rockford, Ill. The speaker briefly covered history of slinger machines from the time of the first one in 1914 to the present. The first machines, based on the principle of gravity, were unsuccessful, but when centrifugal force was used to throw sand into molds they operated satisfactorily.

Most of today's machines utilize an electrically driven impeller and sand feeder belts operating at speeds coordinated with the impeller speed. Hand directed machines will sling 600 to 1500 lb of sand per minute, while hydraulically operated machines, ridden by the operator who guides the impeller head with a joy stick, will sling up to 2700 lb of sand per minute.

Mr. Putz discussed the development of permanent and motive type sand-slingers and their use in various foundry installations. He dwelt at some length on automatic slinger machines which run without an operator. Use of such machines makes

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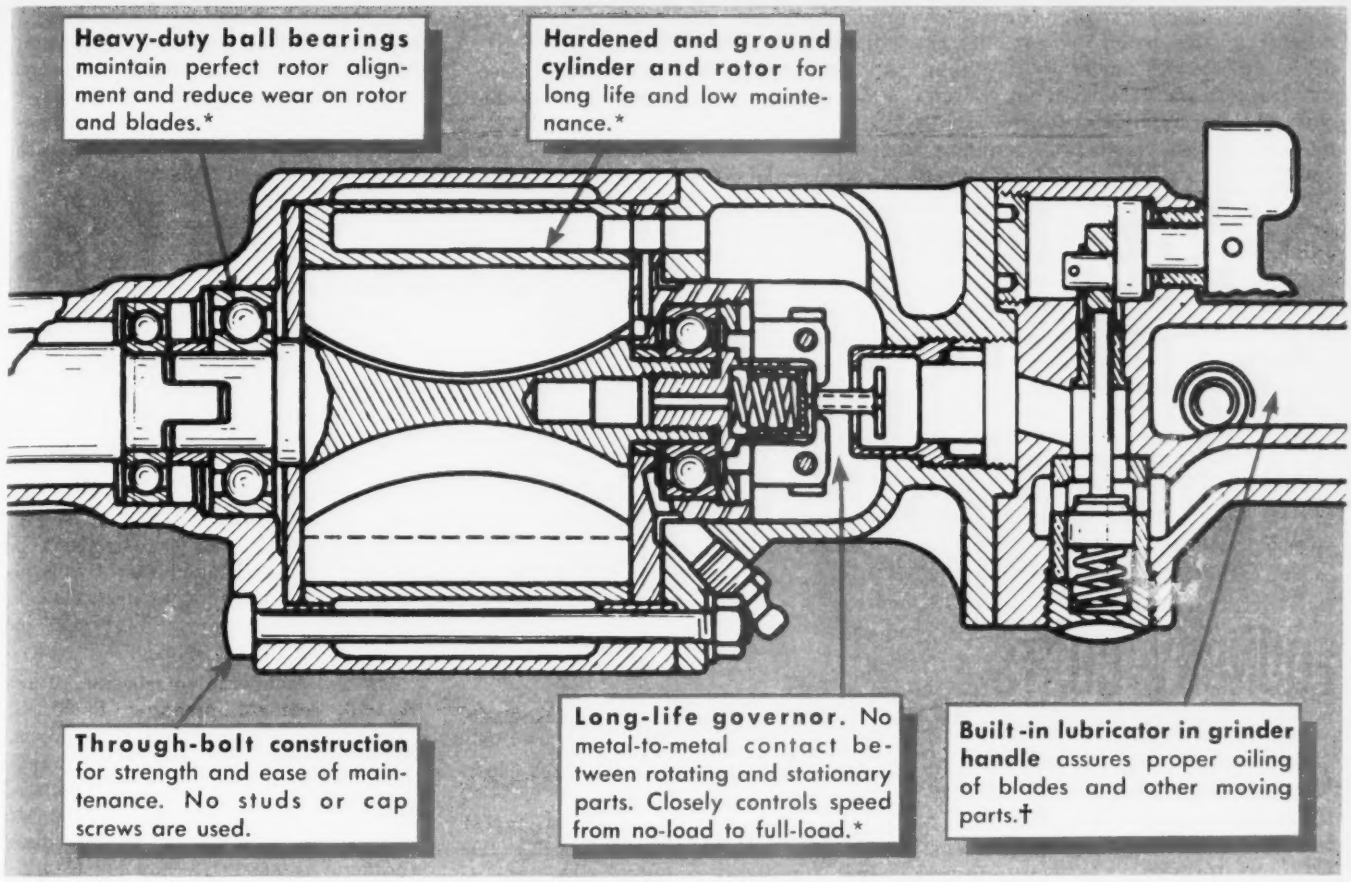
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(*Concluded from page* 174)

necessary the exact placement of flasks under the machine to obtain uniform results. He went on to discuss cycling arrangements for such machines when flasks are carried on conveyors, transfer cars or turntables.

Two papers and a movie were presented at the second session, with James Thomson, Continental Foundry & Machine Co., East Chicago, Ind., presiding, and H. W. Johnson, Wells Mfg. Co., Skokie, Ill., as co-chairman.

The first paper, "Jolt Rockover Molding Machines for Medium and Heavy Castings," was given by K. M. Smith, Caterpillar Tractor Co., Peoria, Ill. The speaker covered jolt machines made in various sizes to handle up to 40,000 lb work. He discussed the use of jolt rockovers and jolt rollovers for various types of molding operations.

Mr. Smith also presented the second paper, dealing with "special and Automatic Molding Machines." The purpose of using such machines is to increase output per man-hour and to get more uniform mold hardness, according to the speaker. All operations of the machines described are push-button controlled. He went on to describe mold making operations using the machines in foundry automatic molding layouts.

The motion picture, "Mechanization in Molding, II," was shown by H. C. Weimer, Beardsley & Piper Division, Pettibone Mulliken Corp., Chicago. It showed various degrees of mechanized molding operations in different foundries.

FOUNDRY COSTS

COST accounting problems were considered at two sessions, sponsored by the Foundry Cost Committee. The first was a panel discussion at which Ralph L. Lee, Grede Foundries Inc., Milwaukee, was chairman and G. E. Tisdale, Zenith Foundry Co., Milwaukee, served as co-chairman. Discussion leaders included C. S. Roberts, Dodge Steel Co., Philadelphia, and C. E. Westover, Westover Engineers, Milwaukee.

A series of questions proposed by the committee, was distributed among the audience. In replying to the first —how often should burden rates be revised for estimating purposes?— it was agreed that these figures should be checked at least once a year or when there have been changes in labor and material costs; or when production equipment changes the methods of operation in any department.

With regard to the rate of capacity at which burden rates should be established for cost accounting purposes, Mr. Westover pointed out that the miscellaneous jobbing shop offers the greatest variation and presents the greatest difficulty. If a shop has a 40-hour week and one full shift in the production departments, that establishes the capacity for determining normal operation. For many foundries, the committee pointed out, 65 per cent of capacity has been found satisfactory as a normal operation figure.

In estimating scrap on a job, some of the foundrymen present stated they have established standard scrap losses for various types of castings, and if some jobs run higher, an additional scrap charge is made for those particular jobs.

Differences in yield affect metal costs in that the cost of melting the metal originally must be recovered. Therefore, it was suggested that metal costs should be computed on the weight of the metal poured in the mold rather than on the weight of the casting.

In estimated welding costs for castings, it was suggested that a standard cost be shown for welding; and on production runs it is possible to determine the cost for the run. The charge should be made against the job itself and not taken out of overhead.

Excess costs are provided for in each department by a percentage in the burden rate, therefore when an excessive cost presents itself in a particular operation, it should be charged against that department since the cost estimate has provided against the contingency.

It was generally agreed that each type of operation should be segregated and separate burden rates be established. In this way it is possible for the foreman in charge of any particular department to check his production volume against the expenses charged to his operation.

The Foundry Cost Committee also co-operated with the Motion and Timestudy Committee in arranging a session on "Pricing Castings Using Standard Costs," which was presented by J. A. Westover, Westover Engineers, Milwaukee. R. L. Lee, Grede Foundries Inc., Milwaukee, chairman of the session, introduced M. E. Annich, American Brake Shoe Co., Mahwah, N. J., who presided.

Mr. Westover pointed out that standard costs are predetermined costs established for materials, labor and expenses. He suggested establishing standards by cost centers, which are distinct spots within a department against which operation and over-costs are accumulated. The speaker then illustrated with slides several forms which serve as check lists in figuring elements to be considered in pricing a casting. He recommended determining the price on a per casting basis. He also suggested that production elements be estimated by time units. Advantage is that time values remain constant—as long as production methods are the same—whereas rates of pay may vary. It is Mr. Westover's belief that cost accounting should be kept separate from the regular accounting department so that costs may be kept in mind on a long-range scale.

In the following discussion, Paul Arnold, resident manager of U. S. Pipe & Foundry Co., Chattanooga, Tenn., addressed a letter to the meeting in which he stressed the importance of relying on time studies for setting cost standards. They reduce the time necessary to develop this information and also provide a means of control by showing if a job had been performed within efficiency limits.

Dedicates International Iron and Steel Library

William H. Worrilow, president, Lebanon, Pa., spoke in Schaffhausen, Switzerland, May 3, at the dedication of an international library devoted to the history of iron and steel. The library, comprising over 8000 rare volumes, one written in 1280, was assembled under the auspices of George Fischer Steel Works, Schaffhausen, in a former convent building overlooking the Rhine near the Fischer factory.

A private committee of trustees representing Switzerland, United States, France, Britain and Germany is to administer the library as an international research center for iron and steel industries and social historians.

Back at Lebanon on May 15 Mr. Worrilow participated in the 25th annual meeting of the Philadelphia Post of the American Ordnance Association where he presented a stainless steel key to General Jacob L. Devers, USA (Ret'd), guest speaker. Lebanon Steel Foundry and Indiantown Gap Military Reservation were hosts for the meeting.

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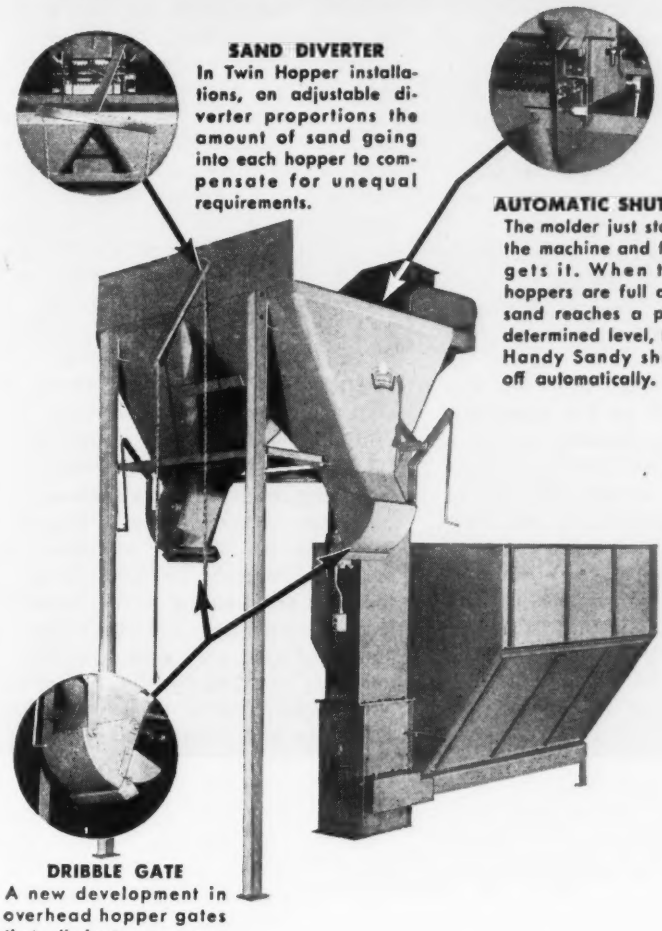

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SAVINGS FROM THE FIRST UNIT PAY FOR THE NEXT. You don't have to make a major investment for the Handy Sandy. You can equip one floor at a time — the savings from one unit will help pay for additional units.

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NAVAL SHIPYARD PERSONNEL HOLDS

Foundry Practice Conference

By EDWIN BREMER
Metallurgical Editor
FOUNDRY

NEARLY 100 from U. S. Naval Shipyard foundries and laboratories attended a foundry practice conference held at Norfolk Naval Shipyard, Portsmouth, Va., Apr. 28-30. Group was welcomed by D. H. Clark, commander of the shipyard, and Capt. R. E. W. Harrison, Bureau of Ships, Washington, made the response. The latter pointed out the progress in foundry methods, metallurgy and materials during the past decade, the possibility of casting airplane monolithic structures, and the need of freest interchange of technical ideas to bring about the best possible castings requiring the least machining.

With L. L. Martin, Norfolk Naval Shipyard, presiding, E. D. Boyle, Puget Sound Naval Shipyard, Bremerton, Wash., discussed application of perlite as a medium for forming insulating sleeves or collars for sprues and risers as well as an additive to facing sand to obtain smooth surfaces, good peeling, and to provide a cushioning action. In core sand the material decreases penetration and veining. For sleeves the following mixture is used; 24 lb perlite, 8 pt early-high cement, 1 pt western bentonite mixed together dry. Then 5½ gal water is added with rapid mixing to obtain good distribution. Collars are made from the mix, air dried overnight, and then 8 hr at 250° F.

Use as Facing

Type of perlite used is grade 0 which has an AFS fineness of 113. For facing sand for bronze plaques a mixture of 50 per cent perlite and 50 per cent No. 0 Albany sand gave excellent results. For other bronze castings a facing composed of 250 lb No. 0 Albany sand, 8 lb western bentonite and 12 lb perlite is being used. Steel facing sand is composed of 1000 lb Ottawa sand (57 fineness), 50 lb silica flour, 45 lb bentonite, 10 lb fireclay, 9 lb dextrine gums, and 12 lb perlite.

William H. Baer, Bureau of Ships, Washington, described some of the investigational work being conducted in the various naval shipyards. This covers a wide range, including studies of spheroidal cast iron, production of stainless steel propellers, shell molding, temperature measuring equipment for continuous melting furnace operation, standard molding methods, relationship of molding technique to foundry defects, linings for induction furnaces, specifications for various ferrous and nonferrous alloys, metal flow currents in molds and effects, production of radiographically sound bronze castings, specifications for crucibles, insulation of risers, etc.

J. R. Powers, Portsmouth Naval Shipyard, Portsmouth, N. H., described an investigation of gating and risering methods for bronze pressure castings. Procedure was to make 1 x 8 x 8-in. plates employing a variety of gating systems, Plates then were machined, ⅛-in. material being removed from each side, and subjected to pressure testing. Some of the plates had an additional ¼-in. removed on one face. Plates also were examined radiagraphically. Mr. Power said results indicated that difficulty in obtaining leakproof castings is not due so much to lack of density but rather to interdendritic shrinkage or interconnected passages in the less dense areas.

In discussion T. A. Triplett, Triplett & Barton Inc., Burbank, Calif., stated that better definition of defects in radiographs is being obtained by increasing film density up around 2.5 for higher contrast. Usual density of 0.7 to 1.5 gives low contrast. With the higher density a strongly illuminated film viewer is required. C. L. Frear, Bureau of Ships, Washington, pointed out that experience is required for correct interpretation of radiographs since metal grain structure and flow lines may be mistaken for defects. H. Harris, Alloy Engineering & Casting Co., Champaign, Ill., called attention to use of fluoroscopy to inspect for gross defects.

In the afternoon session B. N. Ames, New York Naval Shipyard, Brooklyn, N. Y., spoke on shell molding. Details may be found in the article "The Shell Molding Process—Its Mechanics and Applications" by Ames, Donner and Kahn, June FOUNDRY, p. 112. Rear Adm. J. C. Metzel (Ret.), Owens-Corning Co., Washington, discussed briefly various applications of a combination of Fiberglas and plastics or resins. In the foundry Fiberglas is employed to reinforce matchplates made from resins. Adm. Metzel also indicated that the material might have possibilities in shell molding.

On the second day H. Edsal, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., described use of cement-molding to produce steel and other alloy castings weighing from 5000 to 100,000 lb. In the process new sand bonded with about 12½ per cent early-high-strength cement is employed for facing. Backing sand is composed of reclaimed old sand bonded with about 9 per cent cement. Advantages claimed are greater dimensional accuracy since after the mold hardens there is no warp or distortion; castings peel clean; no organic materials are employed, and no flasks or ovens are required.

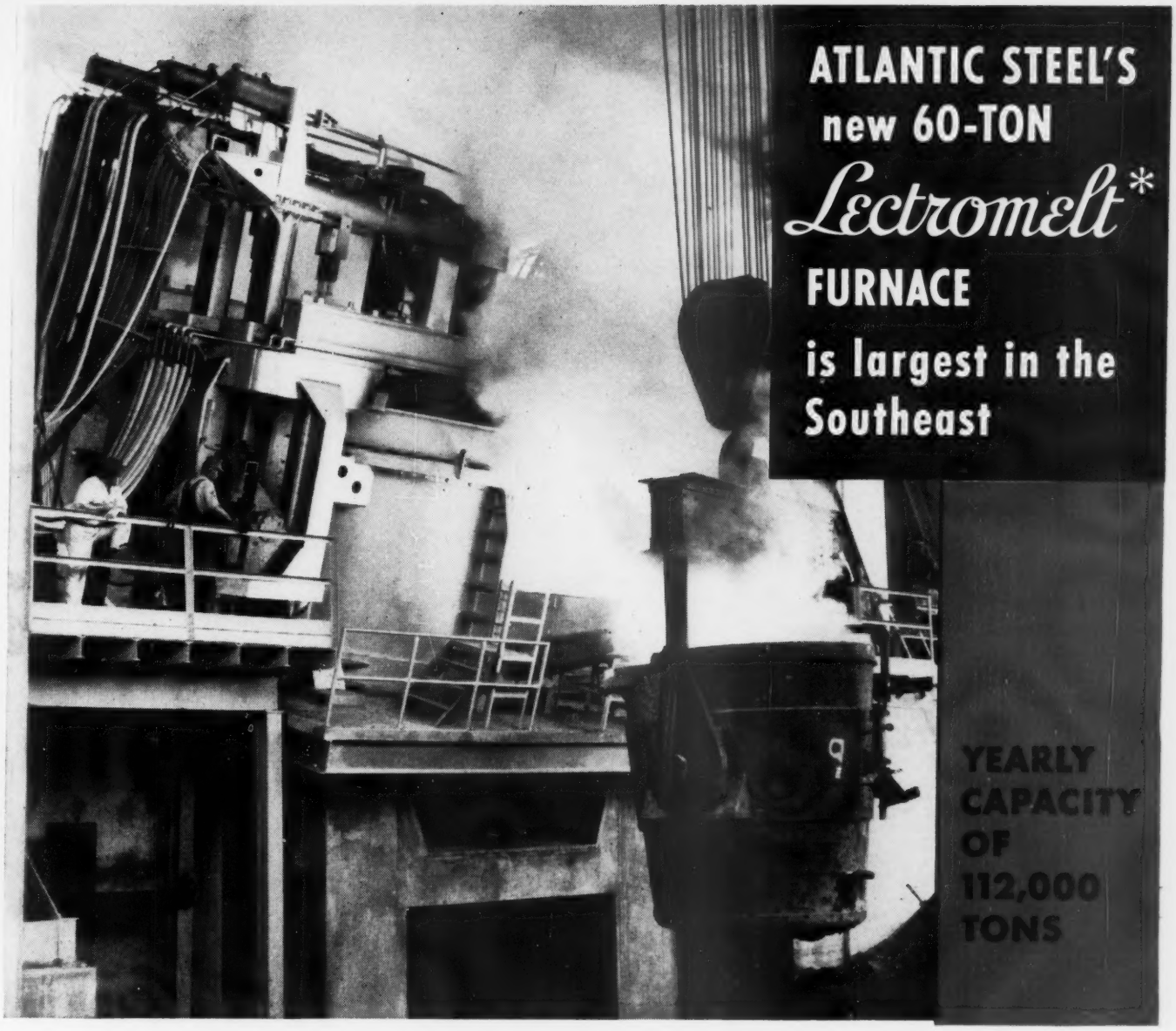
Outline Research Problems

H. F. Bishop, Naval Research Laboratory, Washington, touched briefly on research problems under investigation at the laboratory which include melting under controlled atmospheres and under vacuum, effect of gases on various alloys, development of a flash x-ray machine for rapid film exposure, development of x-ray equipment for examining metal flow in molds to determine its relationship to defects, explosive shock loading of flat plates to determine the properties of steel at various temperatures, relationship of sands and casting defects, etc. H. H. Harris, Alloy Engineering & Casting Co., Champaign, Ill., outlined the use of ceramics as a mold material.

During the third day's session C. A. Swanson, Boston Naval Shipyard, Charlestown, Mass., described the foundry master molder's role in building and holding a key organization. He pointed out that due to small orders and wide variety of castings, naval shipyards require versatile supervisors. Hence, considerable care and effort are required for proper training of such men. He said that weekly meetings to discuss problems and improve methods was invaluable. He also stated that two charts, one listing the personnel, and the other the functions of work, aided considerably in balancing the available force by work planning.

K. D. Millis, International Nickel Co., New York, spoke on Ductile iron, its progress, and what is ahead. Information presented by the speaker in greatly expanded form may be

(*Concluded on page* 180)



W. E. Moore, inventor of the Moore Rapid Lectromelt* Furnace, was among the celebrities who witnessed the first official pouring of metal here at Atlantic Steel Company, Atlanta, Georgia. The furnace is this company's first electric furnace, and the largest of its kind in the Southeast.

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*REG. T. M. U. S. PAT. OFF.

MOORE RAPID

WHEN YOU MELT... *Lectromelt*

(*Concluded from page* 178)

found in the June issue, p. 128, in an article by one of Mr. Millis' co-workers, A. P. Gagnebin. G. E. Koenig, Bureau of Ships, Washington, discussed training objectives and methods. He mentioned the short-course program for supervisors held at University of California and at University of Pennsylvania, and the training programs for non-supervisory employees. However, he said that of the 928 foundry employees, including 38 apprentices and 3 mechanics, less than 5 per cent are participating in the various programs, and when the supervisory and apprentice groups are eliminated, only 1 per cent of the total is taking advantage of the training facilities.

Concluding discussion meeting was by Thornton C. Bunch, Mare Island Naval Shipyard, Vallejo, Calif., on production of manganese bronze ship propellers. He stated that, during World War II, some 4300 propellers involving 6 million lb of manganese bronze were made at Mare Island. He then described the procedure for molding. Large ones are made in flasks split at an angle along the center. Pattern is one blade on a hub which is moved into the proper positions as molding proceeds. Molding medium is loam which is dried at 500° F. for 17 hr before pouring. Smaller propellers are made in assembled core molds, and the cores are made from oil-sand, or cement-bonded sand.

Purdue Sets Date for Casting Conference

Purdue University, West Lafayette, Ind., in co-operation with the Michiana and Central Indiana Chapter of the AFS, will hold its annual Metals Casting Conference Oct. 30-31 at the university. Theme of the sessions will be to present the castings buyers' viewpoint and then attempt to determine how economical casting production can be achieved to meet buyers' demands and desires.

Conference committee includes: Lewis D. Reiff, chairman, Superior Malleable & Steel Casting Co., Benton Harbor, Mich.; James Barrett, program chairman, National Malleable & Steel Castings Co., Indianapolis; A. E. Peterson, Oliver Corp., Foundry Division, South Bend, Ind.; Vern Spears, American Wheelabrator & Equipment Corp., Mishawaka, Ind.; William Ferrell, Auto Specialties Mfg. Co., St. Joseph, Mich.; Carl Schopp, Link-Belt Co., Indianapolis; E. G. Richardson, Delco Remy Division, General Motors Corp., Anderson, Ind.; James Strom, Strom Brass Foundry, Elkhart, Ind.; H. O. Bailey, Sonith Industries Inc., Indianapolis, and Fred Kurtz, Electric Steel Castings Co., Indianapolis.

Committee personnel from the university include: H. A. Bolz, R. W. Lindley, C. T. Marek and H. A. Montgomery, department of general engineering; M. M. McClure, technical extension division, and G. M. Enos, department of chemical and metallurgical engineering.

Issues Film Bibliography

Bibliography of motion pictures and film strips on foundry practice has been published by United States Department of Commerce, Office of Technical Services, Washington 25. Copies are available for 50 cents.

Precision Casting Committee Meets

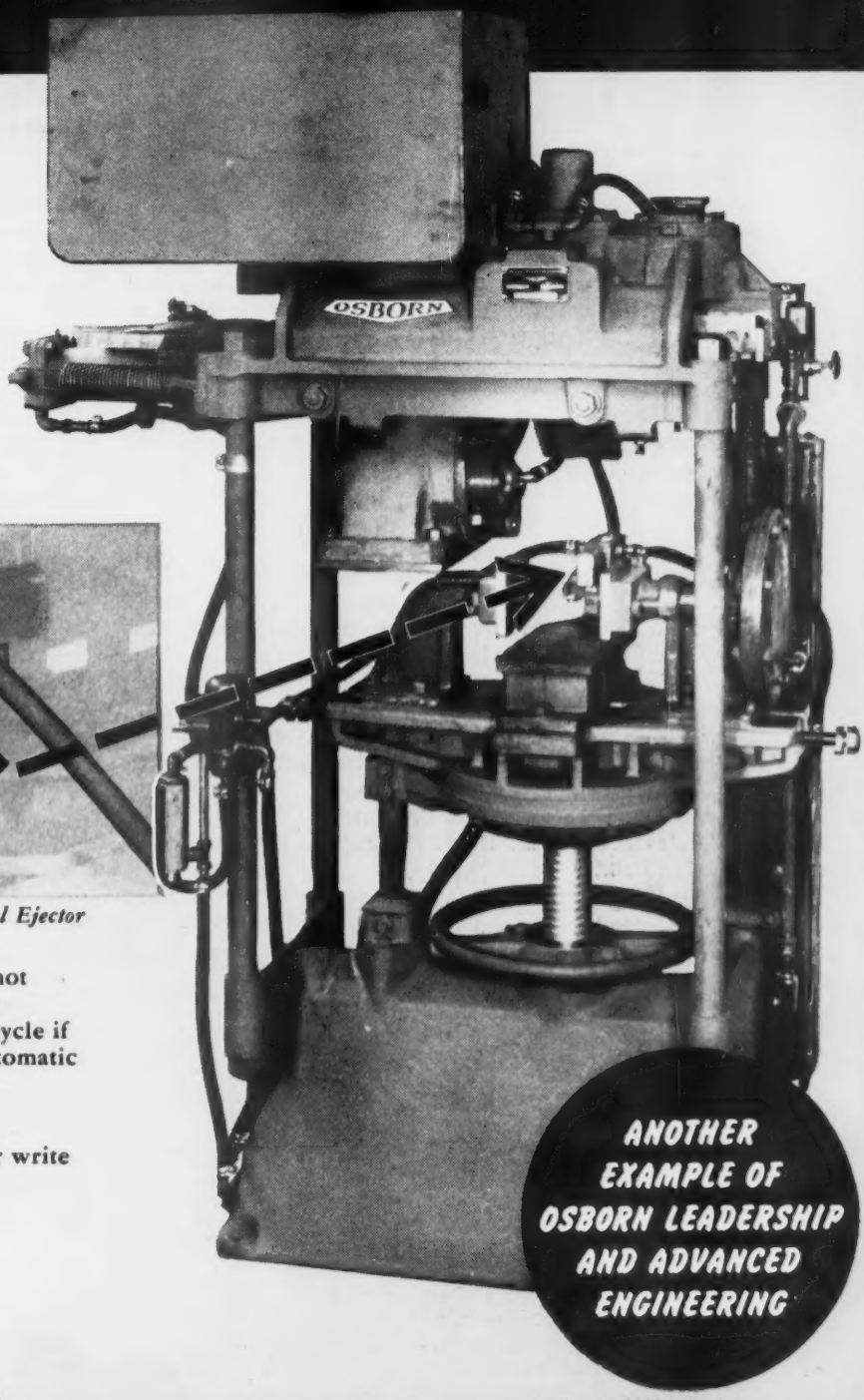
RECENT two-day conference of the government Precision Casting Committee was devoted to a study of progress in perfecting advanced casting processes. Officials of the Alloy Engineering & Casting Co., Champaign, Ill., were hosts for the meeting with the assistance of University of Illinois faculty members. Sessions were held in the college Union building.

Included in the committee are metallurgists, engineers, scientists, and other leading government engineering personnel concerned with the specification and utilization of advanced casting processes in national defense.

Alloy Engineering & Casting Co. is conducting castings research and development projects for the U. S. Navy and Air Force. H. H. Harris, president, General Alloys Co., Boston, is project director.

Committeemen and hosts who attended the meeting are shown above. Seated at the table is J. F. Gorman, Springfield Armory, Springfield, Mass. Standing, left to right, are: Maj. G. O. Shutzbaugh, Headquarters, USAF, Washington; Lt. S. Terhune, Watervliet Arsenal, Watervliet, N. Y.; L. DiNuzzo, Watervliet Arsenal; Samuel Lipson, Frankford Arsenal, Philadelphia, committee chairman; J. Panda, Springfield Armory; B. N. Ames, New York Naval Shipyard, Brooklyn, N. Y.; W. H. Baer, Welding, Casting & Forging Branch, Bureau of Ships, Navy Dept., Washington; A. L. Tarr, Ft. Belvoir, Ft. Belvoir, Va.; Tom Franks, vice president, General Alloys Co.; J. W. Weeton, NACA, Cleveland; T. F. Kearns, Bureau of Aeronautics, Navy Dept., Washington; J. D. Dunbar, office of Chief of Army Ordnance, Washington; P. E. Goettsch, Rock Island Arsenal, Rock Island, Ill.; Joe Wooters, assistant to the vice president, General Alloys Co.; V. H. Vieths, Rock Island Arsenal; Tom McNamara, associate project director, Alloy Engineering & Casting Co., and Mr. Harris.

NEW CONTROLS
for Osborn Core Blowers

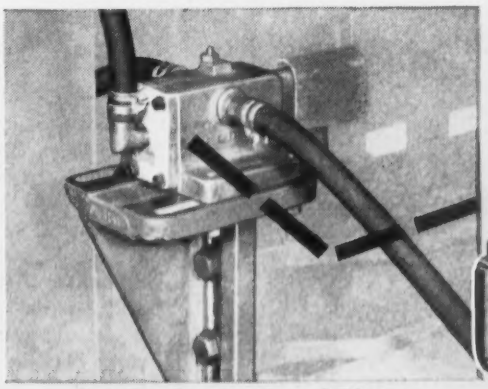


• **Automatic Controls with Core Box Ejector.** Cycle automatically initiated by core box when in blowing position on table.

Cycle automatically terminated after core is blown and box is ejected.

• **Fast Efficient Production.** Used on double box operations. Particularly suited for vertically parted core boxes. OPERATOR STRIPS ONE BOX WHILE OTHER IS BEING AUTOMATICALLY BLOWN.

• **Preset Time Cycle.** Machine operating cycle 3½ to 4 seconds. Since machine generally waits for operator, production is determined by speed at which cores can be stripped and racked.



Core Box Starting Control Ejector

• **Simple to Operate.** Workman needs only to insert core box. Machine automatically starts and goes through the blowing cycle, ejects core box and stops.

• **Proven Safe.** Speeds of various elements in automatic cycle are adjustable to suit requirements of job. Machine will not repeat cycle until operator initiates starter control by inserting core box. Emergency safety button to stop cycle if core box is loaded incorrectly. Sequential type air automatic controls. No electricity required.

• **Get the Facts.** Your factory trained Osborn foundry specialist will gladly furnish complete details. Call or write *The Osborn Manufacturing Company, Dept. 777, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

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FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Activities of Foundry

GROUPS

Birmingham

ELECTION of officers by the Birmingham District Chapter of AFS preceded the technical program of its meeting on May 23 at the Tutwiler Hotel. Fred K. Brown, Adams, Rowe & Norman Inc., was elected chairman; Biddle W. Worthington, McWane Cast Iron Pipe Co., vice chairman; John F. Drenning, Kerchner, Marshall & Co., re-elected secretary-treasurer. Newly elected directors are: Charles S. Martin, E. C. Finch, A. J. Fruchtl and Aubrey H. White.

T H. Benners, chairman of the Educational Committee, awarded $350 in defense bonds to the following winners in the chapter's apprenticeship contest: $50 bonds were given to Duvall H. Easley, Mark C. Gregoire, John L. Cummings, A. G. Lovvorn; $25 bonds were presented to Paul W. Townes, Donald Snyder Brown, Raymond C. Pearson, Douglas E. Kelley; and $10 in savings stamps were awarded to Vernon L. Bradford, Sylvester S. Lathem, David S. Luck and Jeff Bell.

M. L. Carl served as quiz master for the technical quiz program. His panel of experts included J. A. Bowers for problems pertaining to steel; Vernice I. Byford, general foundry practice; Dr. J. T. MacKenzie, foundry metallurgy; Robert L. Jones, patterns and pressure castings; Frank W. Lane, sand; Asa Lloyd, nonferrous; J. V. Blackman, coke; M. D. Neptune, cupola operation. Many technical questions dealing with actual problems were asked and were ably answered by the experts for the more than 100 foundrymen and guests present.—*J. P. McClendon, Stockham Valves & Fittings*

New England

MAY MEETING of the New England Foundrymen's Association was held at the Kenmore Hotel, Boston. Among the 80 members and guests present were three AFS student members from Massachusetts Institute of Technology.

Joseph T. Williamson, manager, industrial relations department, Westinghouse Electric Corp., Springfield, Mass., spoke on "Industrial Relations at Work." Mr. Williamson has had considerable experience in the field and he reviewed many of his experiences and touched upon several of the common problems of management with regard to labor, such as seniority, working conditions, job classifications, employees' discipline and employee advancement. Mr. Williamson charged top management that it has been lax in keeping foremen or direct line supervision well informed as to plans for the present and its best guesses as to the future.—*Myron DeHollander, General Electric Co.*

SAGINAW VALLEY Chapter of the AFS met at Frankenmuth, Mich., May 1. Left to right above, are: R. Verne Righter, Central Foundry Division, General Motors Corp.; Albert E. Edwards, Chevrolet Gray Iron Foundry, GMC, chapter chairman; George A. Jacoby, GMC, principal speaker; Kenneth H. Priestley, Vassar Electroloy Products Co., chapter vice chairman; J. F. Smith, Chevrolet Gray Iron Foundry; Woodrow W. Holden, Eaton Mfg. Co.; A. J. Zahn, Eaton Mfg. Co., and F. James McDonald, Central Foundry Division, chapter secretary

Wisconsin

ANNUAL Old Timers and Apprentices meeting of the Wisconsin Chapter of AFS was held May 16 at Hotel Schroeder. There were 89 old timers and 69 apprentices present with a total attendance of 373. Plaques were presented by Charles Zahn, Vilter Mfg. Co., to old timers who had recently completed 50 years in foundry work; and checks covering prizes for apprentices were given out by Andrew A. Bottoni, foundry and pattern division of the Milwaukee Vocational Schools. Winners were:

David S. Schroeder, Universal Foundry, Oshkosh, Wis.; John Urban, Allis-Chamers Mfg. Co., Milwaukee; and Clement Freitag, Kearney & Trecker, Milwaukee, winners in wood pattern making. Adolph Zinn, George Pearce and Henry Grube of Waukesha Foundry Co., Waukesha, Wis., were winners in the steel molding division. Bruce Lebesch and Don Schmidt, Allis-Chalmers Mfg. Co., and Richard Petri, Vilter Mfg. Co., were winners in the gray iron division; Eugene Walker, Allis-Chalmers, winner in metal patternmaking. Jay Elgeti and Theodore Iwanski, Allis-Chalmers Mfg. Co. and Eugene Potrykus, Nordberg Mfg. Co. were winners in the nonferrous division.

Three of the chapter's apprentices won national prizes: David Schroeder, won first prize in patternmaking; Henry Grube and Adolph Zinn were first and second prize winners, respectively, in steel molding.

The chapter's newly elected officers were introduced during dinner: President is Joseph G. Risney, Risney Foundry Equipment Co., Milwaukee; vice president, A. F. Pfeiffer, Allis-Chalmers Mfg. Co.; secretary, Robert V. Osborne, Lakeside Malleable Castings Co., Racine, Wis Leonard Gratz, G & O Pattern Works, Milwaukee, was re-elected treasurer. Directors elected for three years are: Norman Amrhein, Federal Malleable Co., Milwaukee; L. J. Andres, Lawran Foundry Co., Milwaukee; and Frank M.

(*Continued on page* 184)

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• NATIONAL FOUNDRY SAND CO., Detroit
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Philadelphia

SOUTHERN CALIFORNIA Chapter of the AFS met Apr. 11 at Rodger Young Auditorium, Los Angeles, to hear Donald M. McCutcheon, Ford Motor Co., center, speak on "Nondestructive Testing." At left is Harold Pagenkopp, Angeles Pattern Works, Los Angeles, chapter vice president. Henry Howell, Howell Foundry Co., Los Nietos, Calif., chapter president, is at right. Photo by Ken Sheckler, Calmo Engineering Co.

(*Continued from page* 182)

Kulka, Motor Castings Co., Milwaukee.

The coffee talk featured Elroy Hirsch who showed a number of films of the 1951 Green Bay Packer football game highlights. Principal speaker was Carl Taylor, president, Waukesha State Bank, Waukesha, Wis., who talked on "America Tomorrow."—*John E. Hubel*

Pittsburgh

LARGEST gathering of the year, 150 members and guests, attended the May 19 meeting of the Pittsburgh Foundrymen's Association held at the Fort Pitt Hotel. D. J. Murray, the Borden Co., New York, discussed the shell molding process.

Mr. Murray said that shell molding brings to the foundry industry precision casting at conventional sand casting cost, reduced machining operations because of greater casting accuracy, reduced sand handling and elimination of much sand-handling equipment, possibility of using unskilled and female labor, smaller factory space requirements, simplification of cores through elimination of wire and rod reinforcements, and savings in metal because of more accurate casting and reduced finish machining. Previously 20 to 30 lb castings were considered the upper limit, but now castings in excess of 200 lb are in the making.

Coring problems remain to be solved. Resin and sand seem to segregate during any blowing operation. Resin being lighter than the sand has a tendency to pass through the mixture leaving the sand grains without a bonding agent. Also, a new method must be devised to gain an adequate resin-sand distribution over all surfaces of complicated core boxes. At least one well-known exponent of shell molding has abandoned shell cores in favor of urea resin bonded solid cores in the smaller sizes from 4 inches down. Results are completely satisfactory.

Officers of the association for the next year will be: President, F. B. Mahoney, Richmond Radiator Co.; vice president, F. H. Reuwer, Westinghouse Electric Corp.; secretary-treasurer, E. P. Buchanan, Pittsburgh Coke & Chemical Co. The executive committee will be made up of H. P. Spilker, Sterrit-Thomas Foundry Co.; O. E. Decker, Acheson Mfg. Co.; Harold Gassner, Rosedale Foundry & Machine Co.; R. H. English, National Alloy Division, Blaw-Knox Co.; and A. M. Cadman Jr., A. W. Cadman Mfg. Co.—*Dan Reebel*

TOLEDO Chapter of the AFS held its April meeting at the Toledo Yacht Club, Toledo, O. Left to right are: J. A. Mescher, Unitcast Corp. and chapter chairman, who spoke on "What Core Blowing Can Do for You," J. G. Blake, Alloy Founders Inc.., vice chairman, and B. J. Beierla, E. W. Bliss Co., director

Chicago

ANNUAL business meeting with election of officers and four roundtable sessions at the Chicago Bar Association, May 13, constituted the finale to Chicago Chapter activities for the 1951-52 season. About 140 attended the meeting.

John H. Owen, Chicago district sales manager, Harbison-Walker Refractories Co., is the newly elected president, advancing from the post of vice president. New vice president is John A. Rassenfoss, research metallurgist, American Steel Foundries, East Chicago, Ind. Robert L. Doelman, sales engineer, Miller & Co., succeeds himself as secretary.

Newly elected directors include Fred L. Riddell, plant metallurgist, H. Kramer & Co.; Robert P. Schauss, Chicago sales manager, Werner G. Smith Inc., and B. C. Yearley, assistant manager, National Malleable & Steel Castings Co.

Office of treasurer is appointive by the board of directors and James T. Moore, office manager, Wells Mfg. Co., Skokie, Ill., will continue in this capacity. President Walter W. Moore also announced the appointment of Roy W. Bennett, foundry engineer, Hydroblast Corp., as assistant secretary.

In assuming his new office of president, Mr. Owen presented the chapter's "Oscar", the past president's statuette, to retiring President Moore.

For its roundtable session, the Gray Iron Division devoted discussion to "Future Foundrymen." Two speakers were George A. Davis, foundry instructor, Crane Technical High School, and Roy W. Schroeder, assistant professor, foundry and pattern laboratory, Navy Pier Branch, Uni-

(*Continued on page* 186)

How to cut forging costs

ONE GOOD WAY to make *more* forgings at *less* cost is to line your furnaces with B&W Insulating Firebrick.

For example, A. FINKL & SONS—a leading manufacturer of heavy forgings and a pioneer user of B&W Insulating Firebrick—has made appreciable fuel savings with these lightweight brick. What's more, this company found that B&W Insulating Firebrick have given up to 3 years life in their forging furnaces.

The table below shows five other typical records of B&W IFB savings.

COST SAVING DATA ON DROP FORGE FURNACES LINED WITH B&W INSULATING FIREBRICK

Furnace	Type of Forge	Type of Furnace	Controls	B.T.U./lb. Steel		Reduction in cost of Producing Forgings
				Ordinary Firebrick Lining	Insulating Firebrick Lining	
A*	Upset	Slot	Full	4960	1570	$2.27/ton
B	Steam Hammer	Slot	Air–Fuel	6500	3760	$2.16/ton
C	Drop Hammer	Slot	Full	4000	2400	$1.28/ton
D	Steam Hammer	Slot	None	3180	1620	$1.24/ton
E	Steam Hammer	Slot	Full	3500	1400	$1.52/ton

*All furnaces except "A" spring mounted.

Since durable B&W Insulating Firebrick store and conduct less heat, they also assure better temperature and quality control. By reducing cycle time, they make possible higher furnace output. All these advantages are due to B&W's three decades of specialized refractories engineering.

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(*Continued from page* 184)

versity of Illinois. Robert Hendry, foundry superintendent, Love Bros. Inc., Aurora, Ill., served as chairman.

"Malleable Iron Annealing" was the subject of the Malleable Division roundtable at which Frank Czapski, metallurgist, Chicago Malleable Castings Co., presided. W. D. McMillan, metallurgical supervisor, McCormick Works International Harvester Co., was the speaker.

Steel Division conducted a question-and-answer panel, with Leo F. Dennie, technical service, Black Products Co., the expert on "Sand"; L. D. Pridmore, president, International Molding Machine Co., the expert on "Core Blowing"; and Mitchell Silverstein, vice president, Specialloy Inc., the authority on "Metallurgy." Albert DiGirolamo, foundry foreman, Chicago Steel Foundry Co., was chairman.

The Nonferrous Division roundtable pegged its deliberations on "Brass and Bronze Foundry Practice," with Fred L. Riddell, plant metallurgist, H. Kramer & Co., presiding. Speaker was Robert F. Dalton, development engineer, U. S. Gypsum Co., who in connection with his presentation showed a short film on use of plaster molds for nonferrous alloys.—*Erle F. Ross.*

Detroit

CASTINGS vs Patterns" was the topic of the Apr. 24 meeting of the Detroit Chapter of AFS. For this roundtable session, three automotive men conducted a verbal tug-of-war over design limitations of patterns and castings. Larson H. Kinney, Dodge Division, Chrysler Corp.; Harry G. McMurray, Ford Motor Co., and Alexander A. Andrews, Pontiac Motor Division, General Motors Corp., drew a barrage of questions from the audience with their controversial remarks.

A group of foreign foundrymen representing 12 countries in Europe, Asia, and the United Kingdom were visitors at the meeting.

Nominating committee offered the following slate of officers: Chairman, Michael Warchol, Atlas Foundry Co.; vice chairman, Harry E. Gravlin, Ford Motor Co.; secretary, R. L. Orth, American Wheelabrator & Equipment Corp.; treasurer, E. J. Passman, Frederic B. Stevens Inc. Directors nominated for a three-year term are: Walter Kantzler, Kelsey-Hayes Wheel Co.; Harold W. Schroeder, Michigan Steel Casting Co.; Vernon H. Patterson, Climax Molybdenum Co. of Michigan; and C. A. Stanley, Chrysler Corp.

Directors with terms ending in 1953 are: C. W. Hockman, Cadillac Motor Car Division, General Motors Corp.; Larson H. Kinney, Dodge Division, Chrysler Corp.; H. G. McMurray, Ford Motor Co.; John J. Watson, C. O. Bartlett & Snow Co. Those who will serve until 1954 are: Alexander A. Andrews, Pontiac Motor Division, General Motors Corp.; Samuel H. Cle-

(*Continued on page* 188)

INTERNATIONAL STUDY TOURS arranged by the AFS in co-operation with the government's Mutual Security Agency were conducted between Apr. 18 and May 14 for visitors from abroad in this country for the International Foundry Congress and Show at Atlantic City, N. J. The group was split into two sections, each visiting different cities. On Apr. 21-23 one section was in Cleveland and was invited by Northeastern Ohio Chapter of the AFS to a reception at Cleveland Athletic Club following plant visitations on Apr. 21. L. T. Crosby, Sterling Wheelbarrow Co., chairman of the reception and plant visitations committee was in charge of the affairs. Views of the gathering are shown

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(*Continued from page* 186)
land, Eastern Clay Products; E. W. Gerhard Jr., Swedish Crucible Steel Co.; and R. Grant Whitehead, Claude B. Schneible Co. Retiring chairman Vaughan C. Reid, City Pattern Foundry & Machine Co., is a member of the board ex-officio. — *Howard C. Tuttle*

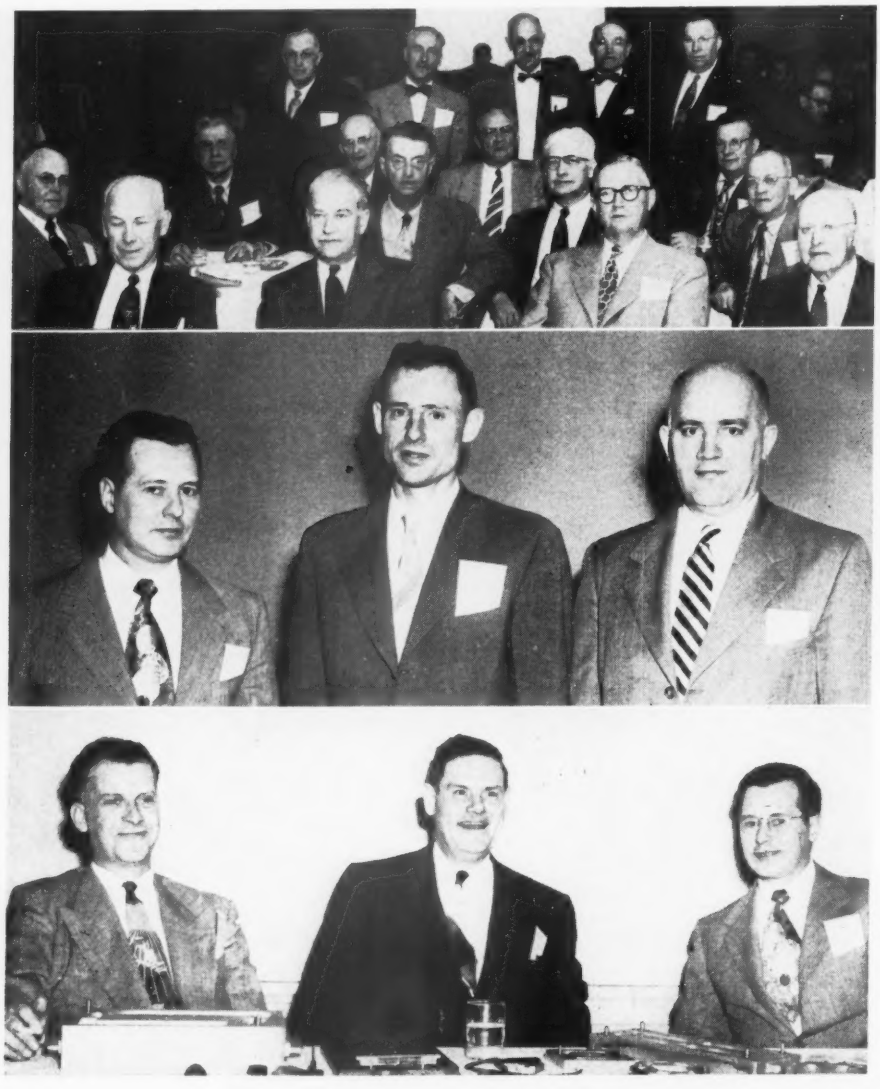
Eastern New York

ELECTION of officers was held by the Eastern New York Chapter of AFS at its May 20 meeting held at Circle Inn, Lathams, N. Y. Those elected are: Chairman, Leigh Townley, Adirondack Foundries & Steel Co.; vice chairman, Ed Lawrence, General Electric Co.; secretary-treasurer, William Stevenson, Rensselaer Valve Co. Directors elected for three-year terms are: Charles Fuller, General Electric Co.; Guy Haines, Sheridan Iron Works and Kenneth Mason, Albany Castings Co.

Speaker was Ralph Lee, General Motors Corp., Detroit, and regular contributor to FOUNDRY, who in his unique style discussed "The Need for Facts in the Human Element." In discussing his experience in dealing with people, Mr. Lee pointed out that everyone differs from everyone else in his make-up and may be described as the bully, the smoothie, the pouter, the clown, all found in every shop. Most people cannot change as much as might be required or desired because of the "metallurgy" of human beings. People are not the same at all times, because of environmental conditions affecting them. Every individual is inordinately proud of his characteristics which differentiate him from others.

His summation emphasized the need to make use of "used" facts especially in this changing world, where humanics are steadily replacing mechanics in prime importance. The job for supervison is to find the reason behind every circumstance and to commence to rely on facts and not on hunches.—*Kenneth F. Echard, Eddy Valve Co.*

TWIN CITY Chapter of the AFS heard Donald Murray (left), Foundry Products Dept., Borden Co., New York, speak at its May meeting. At right is C. Fred Quest, J. F. Quest Foundry Co., Minneapolis, chapter chairman



QUAD CITY Chapter of the AFS elected officers at its May 19 meeting. At top is a group of men who helped found the chapter in 1922. Center, left to right, are newly elected officers for the 1952-53 season: Boyd Hays, Union Malleable Iron Co., East Moline, Ill.; Robert Miller, Deere Planter Works, Moline, and Eric Welander, Union Malleable Iron Co. Bottom, left to right, are: Roy Ray, J. I. Case Co., Bettendorf, Iowa, technical chairman; Lawrence Pridmore, International Molding Machine Co., La Grange Park, Ill., speaker at the meeting, and Boyd Hays. Photos by courtesy of *Rock Island Argus*

Reading

SYSTEMS for reclaiming molding sand were explained by Clyde B. Jenni, General Steel Casting Corp., Eddystone, Pa., at the annual meeting of the Reading Foundrymen's Association held at the Berkshire Hotel, Reading, Pa.

Mr. Jenni stated there are four methods for sand reclamation: Dry, wet, thermo, or heat; and a combination wet and thermo system.

In the thermo process, a temperature of 1200 to 1500° F is employed to cleanse the sand. This treatment burns off completely the carbon from the sand but does not remove the clay film which requires the scrubbing action. Therefore, the method using both heat and water scrubbing does the job efficiently and completely. Mr. Jenni showed a series of slides to illustrate the operation of the system. It was pointed out that about 20 per cent of the original sand is lost through the process, but until a system of reclamation was discovered, all sand formerly was lost.

James S. Hinkly, Dick Bros. Inc., the association's newly elected president, was introduced. Other officers

(*Concluded on page* 190)

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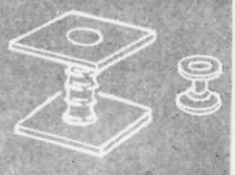
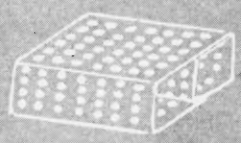
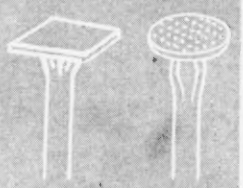
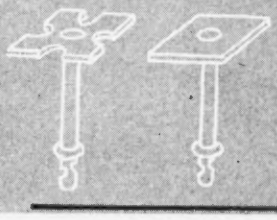
TYPE	CHARACTERISTICS	APPLICATIONS
MOTOR 	FUSE READILY STEMS CAN BE GROOVED HEADS CAN BE PERFORATED CLOSE TOLERANCES ± .002 HEADS CAN BE TILTED	*For Light Sections of* Motor Blocks • Heads • Housings Radiator Sections • Burner Sections • Pump Sections • Farm Equipment • Job Castings
BUTTON HEAD OR BOILER	STURDY STRUCTURE FUSE READILY STEMS CAN BE GROOVED NON SLIP BUTTON HEAD	*For Boiler Sections*
PERFORATED 	10 STANDARD SHAPES MADE TO FIT ALL CONTOURS MADE TO ALL RADII DESIGNED FOR WEDGES LOW IN COST	*For Light Sections of* Stove Castings • Motor Castings Job Castings
DOUBLE HEAD	STURDY STRUCTURE STRONG SUPPORT TO CORE CLOSE TOLERANCES ± .005 STEMS CAN BE GROOVED HEADS CAN BE CANTED	*For Heavy Sections of* Machine Tool Bases • Diesel Engines • Locomotive Frames Side Frames • Pumps • Road Machinery
SINGLE HEAD 	NON-SLIP FORGED HEADS FITTED HEADS WITH ANY RADIUS SOLID SUPPORT	*For Very Heavy Cores of* Diesel Engines • Machine Bases
RADIATOR	UNIFORM BREAK-OFF NICKS DEEP NICKS FOR FIRM KNITTING LOW COST	*For Radiator Sections*
SHOULDER RADIATOR 	EASY TO PLACE FUSE READILY DEEP BREAK-OFF NICKS STAGGERED NICKS FOR FIRM KNITTING UNIFORM SHOULDERS	*For All Thin Sections of* Manifolds • Stove Burners Cylinder Heads

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(*Concluded from page* 188)
are: James Woodward, Excelsior Brass Foundry, vice president; Paul K. Reiniger, Textile Machine Works, treasurer, and William I. Cassidy, secretary. Executive committee members are: George C. Kissell, James Stewart, Morris E. McKinney, John Sigart, A. L. Wentzel, Clair Snell, and Paul B. Harner.—*W. I. Cassidy*

Connecticut Non-Ferrous

THE versatility of "Belt and Disk Grinding" was described by Joseph F. Ramey, Minnesota Mining & Mfg. Co., at the Mar. 19 meeting of the Connecticut Non-Ferrous Foundrymen's Association. The belt equipped with contact wheel and backstand idler is finding increased acceptance in the metalworking field. Contact wheels can be hard for real cutting jobs or soft for polishing. Depending on the type of work, the belts can be coarse to fine, and the usual type of backstand idler can be adjusted in tension from five to 200 lb.

Abrasive belts and disks come in a variety of backings and cutting minerals with grits available from No. 16 to No. 600. Various combinations of paper and cloth are used for backings, one of the toughest being a backing made up of several layers of chemically-treated rag paper molded with a hard stiff fiber. Any standard grinding or polishing lathe can be quickly and easily converted to the belt, contact wheel and backstand idler type of operation. — *John V. McCarthy, Federated Metals Division*

MICHIGAN STATE COLLEGE Student Chapter of the AFS held its annual student-industry banquet Apr. 21. Fred G. Sefing, research metallurgist, International Nickel Co., New York, spoke on "New Developments in the Cast Metals Industry." Cast aluminum ash trays made by the students were distributed. Bruce Harding, student member, designed the souvenir and some of the equipment used in making it. He is shown here with the equipment and one of the ash trays

OBITUARY

ARTHUR SIMONSON, 74, former vice president, Falk Corp. Milwaukee, died May 20 in McConnellsville, O. Mr. Simonson, who had retired in 1946, was born in England. His first employment was with Edgar Allen & Co. Ltd., Sheffield, England, under the supervision of Alexander Tropenas, inventor of the side blow converter process for making steel castings. After arrival in United States in 1900 he spent several years installing converters in various plants. He joined Falk Corp. in 1909, became vice president in charge of foundry sales in 1927 and vice president in charge of foundry operations in 1938. Mr. Simonson was a past president of the Steel Founders' Society of America.

* * *

William T. Stewart, 70, until his retirement in 1925, owner of the Stewart Brass Foundry, Buffalo, died May 8. Mr. Stewart, a native of England, came to United States when he was 16. In 1910 he helped organize the Unique Brass Foundry, Buffalo, which was sold in 1921, and he founded the Stewart Brass Foundry that year.

* * *

Albert H. Thomas, 81, chairman of the board of directors, Buckeye Steel Castings Co., Columbus, O., died May 29. Mr. Thomas was graduated from Purdue University in 1895 and joined Buckeye Steel in 1905. He was president from 1936 to 1945, when he became chairman of the board.

* * *

W. P. Bowdry, 79, former president, Dallas Foundry Inc., Dallas, Tex., died May 15, at his home in Ft. Worth. Mr. Bowdry entered the foundry industry as a young man and in 1928 became president of the Dallas foundry. He retired several years ago.

* * *

Harry J. Colby, 57, president, Fanner Mgf. Co., Cleveland, died May 15. Mr. Colby was born and educated in Cleveland and joined the company in 1913 as a clerk. He became familiar with all phases of production and executive branches of the business and became a company officer in 1934, vice president in 1948, executive vice president in 1950, and assumed the presidency at the beginning of this year.

* * *

Edward O'Connor, for the last five years associated with O'Connor Equipment Co., Chicago, died June 4. Mr. O'Connor was connected with the foundry industry more than 45 years, at one time serving as foundry foreman at the Deering Works, International Harvester Co. In 1923 he joined the Beardsley & Piper Co., Chicago, where he engaged in the sale of foundry equipment until 1947. At that time he and his son, Charles O'Connor, formed the O'Connor Equipment Co. to represent various equipment manufacturers.

EDWARD O'CONNOR

* * *

William J. Deublin, 67, vice president-general manager, Sterling Faucet Co., Morgantown, W. Va., and representative of that company in Cleveland, died May 31 in Atlantic City while attending a convention.

* * *

Julius H. Collin, representative of Benjamin Harris Co., Chicago Heights, Ill., brass and bronze ingots, died May 22, in Pasadena, Calif. Mr. Collin was formerly associated with Federated Metals Division, American Smelting & Refining Co., New York.

* * *

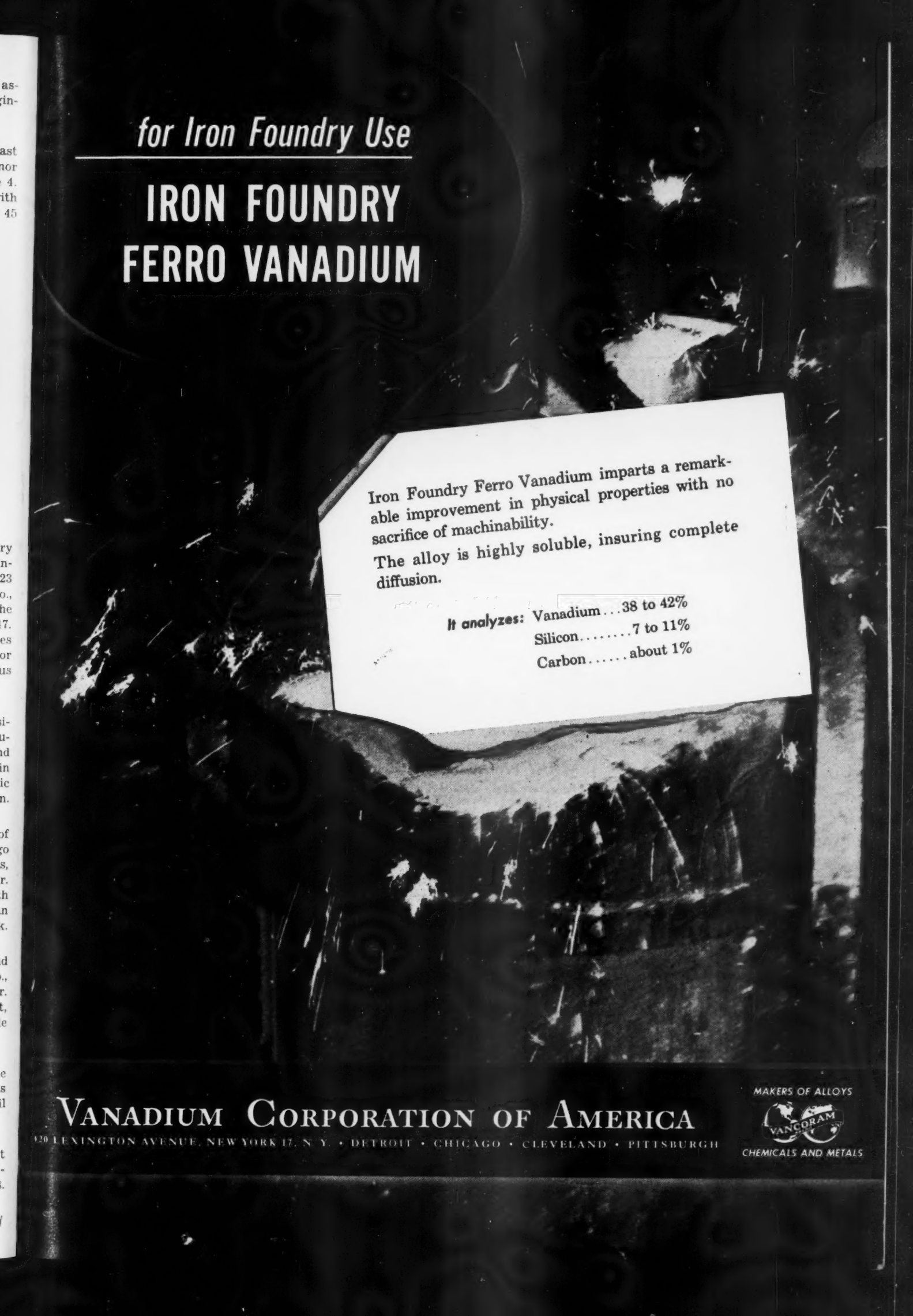
C. Bateman Swasey, president and owner of Belcher Malleable Iron Co., Easton, Mass., died May 14. Mr. Swasey acquired the Belcher plant, one of the countries oldest malleable iron foundries, in 1919.

* * *

Peter A. Markey, 62, one of the founders of Bohn Aluminum & Brass Corp., Detroit, and president until 1949, died May 18.

* * *

Kenneth L. Green, Jr., 43, president Green Foundry Co., St. Louis, founded by his grandfather, died Apr. 28.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Precision Casting Process

(*Continued from page* 93)

commercially could be diluted approximately 50 per cent by the addition of sand with an average particle size of 100 mesh, and still the investment filled its role in the casting process satisfactorily. This indicates that investments may be over-designed. That is, they contain a much higher percentage of binder, therefore have more strength, than is necessary for many applications.

The use of a plaster binder investment for alloys melting over 2000°F has long been discounted in certain quarters. However, plaster, if it could be used as a binder for the higher melting alloys, would offer a substitute for the more critical materials now used.

In the Mercast process the investment used does not contain a binder; however, a rather thick coating is built up on the pattern. When the mercury pattern is melted out a shell is left. This shell is fired and then placed in a flask and surrounded with an investment such as lake sand, or (for rapid cooling) steel shot. This process illustrates that an investment does not have to be strong itself. With the facts known as set forth in this introduction, the Materials Laboratory, Research Division, Wright Air Development Center, undertook a study to develop possible substitute investment materials.

Experimental Procedures — Materials used for the investment refractory in all the work reported in this paper were Lake, Albany and Juniata foundry sand. The screen analysis of the sands is given in Table I. These materials were readily available in the foundry, and though relatively impure when compared with the refractories ordinarily used in the investment casting process, they served satisfactorily for this investigation. It was felt that if satisfactory substitute investments could be developed using a refractory as impure as the materials employed in this work, then the problem of substitute materials for the precision casting process would be well on its way to a successful solution.

The three sands were blended in varying proportions and mixed in various ratios with the different binders used in this work. The compositions were first evaluated for castability (ease with which they could be cast into a flask around a specimen), time required for air hardening or setting, and relative strength after firing at 1600°F for four hours. The compositions evaluated are shown in Table II.

The most promising compositions based on the aforementioned criteria were selected for further investigation. This consisted of making an investment mold containing two wax specimens in the form of a rectangular slug (1 x 2½ x 3/16 in.). One of these specimens was precoated with the alumina silica precoat (62.5 SiO_2 — 37.5 Al_2O_3) prepared as follows:

First 94 grams of silica flour (—325 mesh), 56 grams of alumina (—325 mesh) and 37 grams of silica sand (40 mesh) were dry mixed. After thorough mixing they were added to approximately 80 milliliters of the binder solution which consisted of a 20° Be sodium silicate solution and a 2 per cent polyvinyl alcohol solution in the ratio of 1 to 4. The solids were then mixed with the liquid to form a slurry of the correct consistency for use as the precoat. The alumina silica precoat was found after an extensive investigation, as reported in "Precoat Materials for Investment Casting," American Foundrymen's Society *Transactions* of 1951, to produce the best surface obtainable on casting of the heat-resist-

(*Continued on page* 194)

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PARACOAT Pattern Finish

LASTS LONGER...DRAWS CLEANER...SAVES TIME

- Maintains its hard, smooth, tough, wear-resistant surface under all foundry conditions. Patterns draw clean with no damage to molds.
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(*Continued from page* 192)

ant alloys of the nickel and cobalt base type.

The wax was removed from the mold after it had set by placing it in an oven at 180°F overnight. The following morning the molds were placed in a furnace, heated slowly to 1600°F, and held at this temperature for several hours. They were then removed and a heat-resistant type alloy (composed of scrap from the alloy development program and having an approximate analysis of 20 per cent chromium, 40 per cent nickel, .5 per cent carbon, .5 per cent silicon, 1.0 per cent manganese and balance cobalt) melted by induction heating was cast into the mold at a pouring temperature of approximately 2700°F. When the mold had cooled, the investment was broken away, and each investment evaluated on the basis of the appearance of the casting produced.

Compositions Investigated—The experimental work was necessarily divided into several sections. In each section a different binder was investigated. Table II is therefore divided into different sections. Each section was confined to a definite series of compositions. The sections will be dealt with in this discussion in the order in which they appear in Table II.

In Section A, Table II, the possibility of using alumina-base high-temperature cement as a binder for investment molds was studied. The first phase of this work dealt with a constant sand particle size distribution and the percentage of binder was varied. Two different sand ratios were used: 1 part Lake (50 mesh), 1 part Albany (70 mesh), 1 part Juniata (100 mesh); and 1 part Lake (50 mesh), 1 part Albany (70 mesh), 2 parts Juniata (100 mesh). In both series binder additions were made from 5 to 20 per cent in 2.5 per cent variations. Two commercial investments were also prepared in this phase as comparison standards. Ransom & Randolph's IC-711-G1 and Kerr's Ferrolite were selected as the standards and are included in Section A of Table II.

The castability of the experimental mixes was not good. This was probably due to the lack of suspension offered by the alumina-base cement and to the scarcity of small particles in the refractory. An addition of tragacanth was made to several mixes in an attempt to improve the suspension characteristics and thus the castability. However, it was found that the setting time for the investment was greatly increased. Tragacanth physically holds the water used in mixing, thus preventing the drying and setting of the mold. Tragacanth does improve the castability of the mix but should not be used if a quick setting time for the investment is desired.

From this phase, the first of the investigation, compositions No. 1—5 per cent alumina base cement, 95 per cent refractory (1 part Lake, 1 part Albany, and 1 part Juniata), and No. 8—5 per cent alumina base cement, 95 per cent refractory (1 part Lake and 1 part Albany, and 2 parts Juniata) were found to be the most satisfactory of those studied.

Section B of the investigation dealt with the use of chemical type binders for investment molds. These binders are phosphate salts which, when mixed with magnesium oxide (fused, 300 mesh) and water, react to form a compound with water of crystallization. An example of the reaction occurring is:

$$NH_4H_2PO_4 + MgO + 5\,H_2O \rightarrow MgNH_4PO_4 \cdot 6\,H_2O$$

In this group of compositions the sand ratios were the same as those used for the first section of cement

(*Continued on page* 196)

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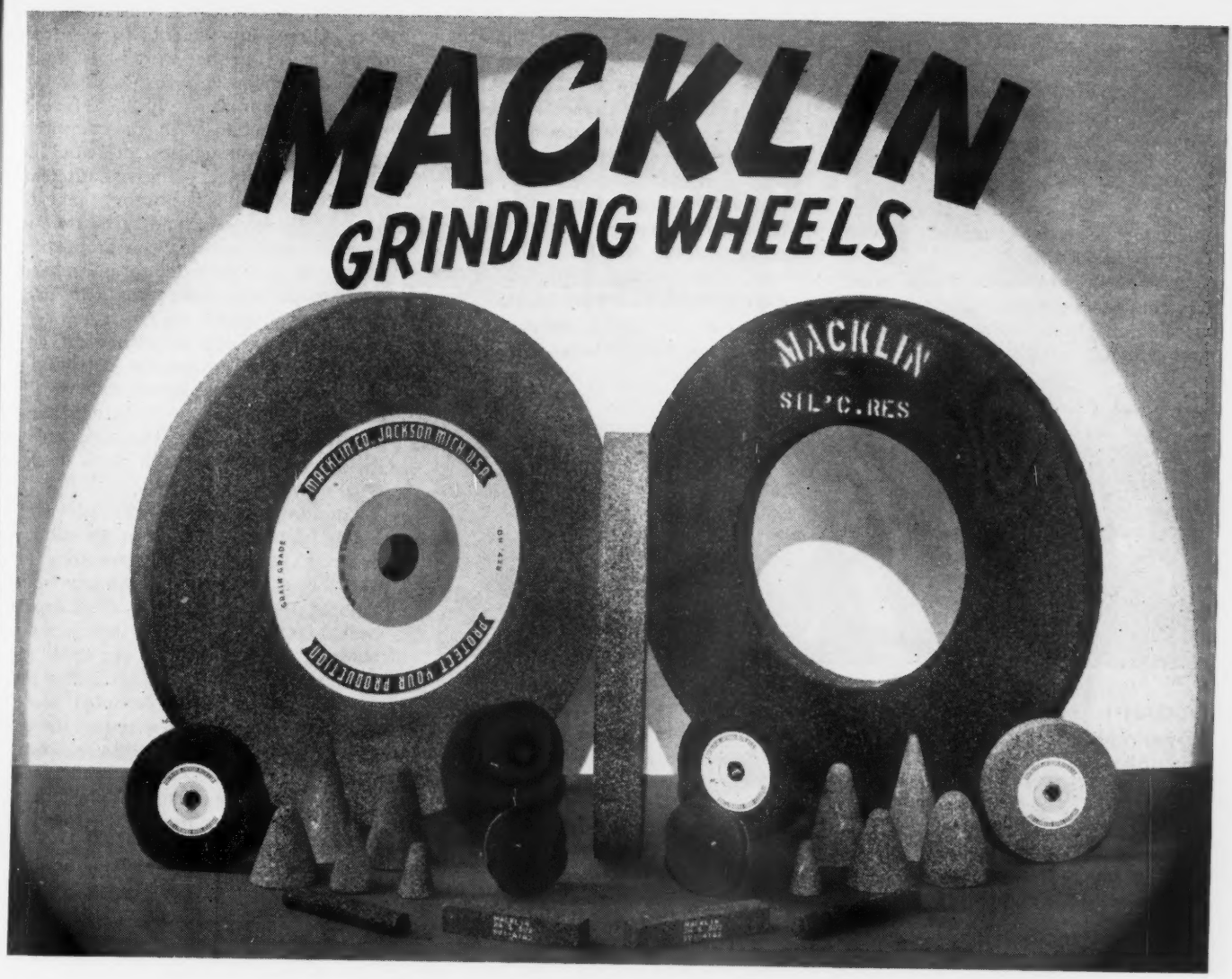

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(*Continued from page* 194)

binders. As can be seen from the reaction there are two ways of varying the amount of binder in a mix. It can be altered by varying either the MgO or the phosphate salt. In this work the MgO was varied from approximately 2.5 to 5 per cent, keeping the phosphate salt in the correct molecular ratio to the amount needed for the reaction.

The phosphate salts investigated for use as investment mold binders were ammonium phosphate, primary and secondary, and calcium phosphate, primary, secondary and tertiary. The best binder materials were found to be ammonium phosphate, primary, and calcium phosphate primary. No reaction occurred with the use of calcium phosphate, secondary and teritary; therefore these materials did not act as investment binders. Ammonium phosphate secondary gave off free ammonia, forming bubbles in the investment, thus making it unsatisfactory as an investment binder.

Some commercial investments used ammonium phosphate as the binder, however, as stated in the introduction, these investments are often over-designed in that they contain too much binder material. Our results show that approximately 2.5 per cent magnesium oxide with the required amount of ammonium or calcium phosphate primary, will give sufficient strength for a satisfactory investment. There was found to be no appreciable difference in the properties of ammonium or calcium phosphate primary binders except that the calcium phosphate set up much quicker. This property can be either an advantage, or disadvantage, depending on the particular investment need. There is a danger if it is not handled very quickly that the investment will set during mixing, thus making it useless for a mold.

Compositions No. 27—2.3 per cent MgO, 7.1 per cent calcium phosphate primary, 90.6 per cent refractory (1 part Lake sand, 1 part Albany, and 2 parts Juniata) and No. 23—2.3 per cent MgO, 6.5 per cent ammonium phosphate primary, 91.2 per cent refractory (1 part Lake sand, 1 part Albany, and 2 parts Juniata) were found to be the most satisfactory of those investigated in this section. However, No. 33—2.6 per cent MgO, 5.1 per cent ammonium phosphate primary, 92.3 per cent refractory (1 part Lake sand, 1 part Albany, and 1 part Juniata) was the equivalent of Nos. 23 and 27 in properties, except that its average particle size was slightly larger.

Plaster Binding Agent

The third section of this investigation dealt primarily with the possible use of plaster binder type investments for the higher melting alloys. Prior to the beginning of this project, an investment mold was made of Kerr's Cristobalite, a plaster binder investment especially designed for the low melting point alloys. The mold contained two cavities. One was faced with alumina-silica precoat while the other was not. A heat-resistant type alloy was cast at 2700°F into this mold and the resulting casting, shown in the accompanying illustration, was examined and photographed.

As can be seen the casting produced from the cavity faced with precoat is very good while the other casting is typical of what would be expected of a high melting point alloy cast into a plaster binder investment. With the knowledge that if the proper precoat is used a plaster binder type of investment is suitable, the work on the third section of this investigation was initiated.

The first phase of Section C, Table

(*Concluded on page* 198)

sil-gan

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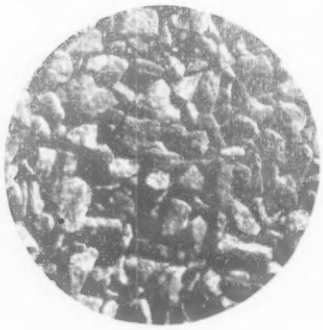

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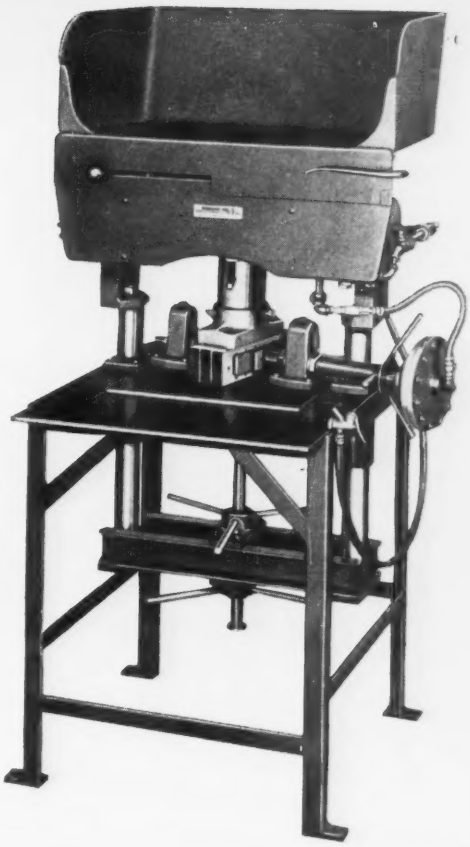

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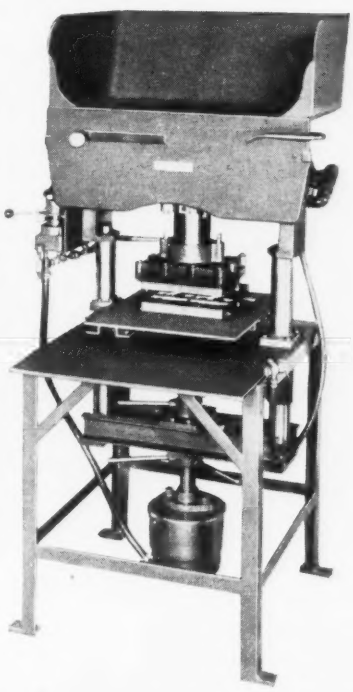

A fast and accurate DRAW TYPE core blower for small work—has stationary sand magazine and many additional features assuring maximum production. Quickly adjusted to accommodate core boxes not requiring the draw feature. Can be equipped with clamping attachment for vertically split core boxes.

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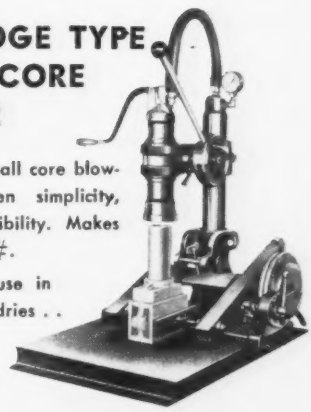

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(*Concluded from page* 196)

II, dealt with plaster as the binder, and bentonite additions to increase the castability of the mix. None of the compositions was satisfactory in this phase because bentonite is similar to tragacanth in that it also physically holds water, thus greatly delaying the setting time of the investment mold.

The second phase of this section was concerned with the combination of plaster and alumina-base cement as the binder. Particle size distribution and percentages of binder were varied. The work accomplished indicated two compositions that would be satisfactory for investment molds. No. 52—80 per cent refractory (8 parts Lake sand, 1 part Albany, 1 part Juniata), 15 per cent plaster, 5 per cent alumina base cement—was the best, but No. 51—85 per cent refractory (8 parts Lake sand, 1 part Albany, 1 part Juniata), 10 per cent plaster, 5 per cent alumina base cement—was also satisfactory.

The third phase of this section considered the possibility of combining plaster with a phosphate salt to form a binder. Two standard investments—one with ammonium phosphate primary and the other calcium phosphate primary—were prepared as a basis for comparison and reference. One mix was prepared with plaster, alumina-base cement and calcium phosphate as the binder materials. The combination type binders were found unsatisfactory because calcium hydroxide, which is anhydrous, was formed. This compound prevented drying of the mold.

The final phase of this work was concerned with the selection of the most promising compositions by preparing investment molds from them. In the prepared molds, two patterns were placed, one precoated with alumina silica and the other not precoated. These molds were heated to 1600°F. At this temperature a heat-resistant type alloy was cast into them at a pouring temperature of 2700°F. When the mold had cooled, the investment was broken away, and the castings were examined. The investments were evaluated on the appearance of the castings produced from them. Compositions Nos. 23, 27, 33, 51 and 52 were evaluated as investment.

Results indicated that all the compositions investigated would be suitable for investment molds. Composition No. 33—2.6 per cent MgO, 5.1 per cent ammonium phosphate primary, and 92.3 per cent refractory—was the best. However, composition No. 52—15 per cent plaster, 5 per cent alumina-base cement, 80 per cent refractory—was also exceptionally good.

From the investigation of possible substitute materials for the investments now used in the precision casting process, it can be concluded that:

1. Low-price foundry sands can be used as the refractory.
2. Approximately 2.5 per cent MgO, together with the molecular amount of phosphate salt, will produce a satisfactory binder.
3. Calcium and ammonium phosphate primary were the only two phosphate salts investigated that were satisfactory for binders.
4. Plaster binder investments can be used for the higher melting alloys if a precoated mold is used.
5. Alumina-base cement and plaster as the binder makes a very good investment mold.
6. Plaster cannot be combined with calcium phosphate to form a binder.
7. Suspension agents, such as bentonite and tragacanth, should not be used in an investment because they hold water physically, thus preventing drying.

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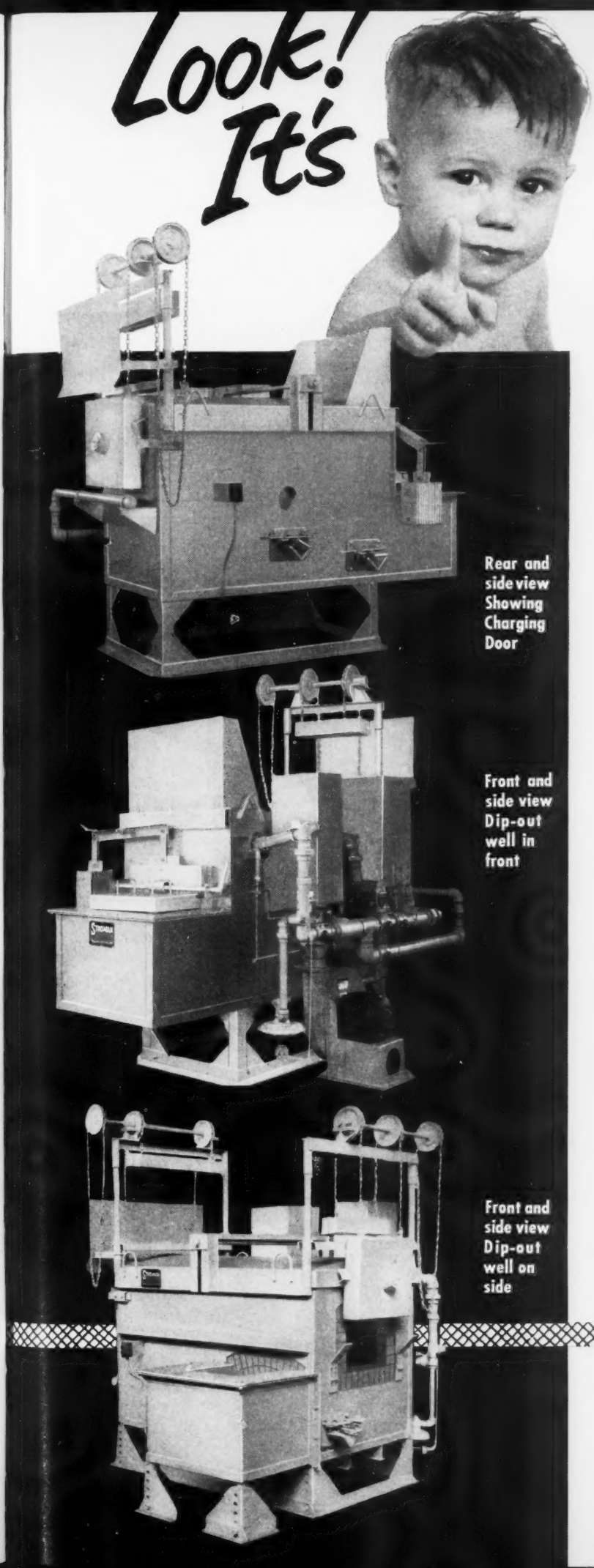

Rear and side view Showing Charging Door

Front and side view Dip-out well in front

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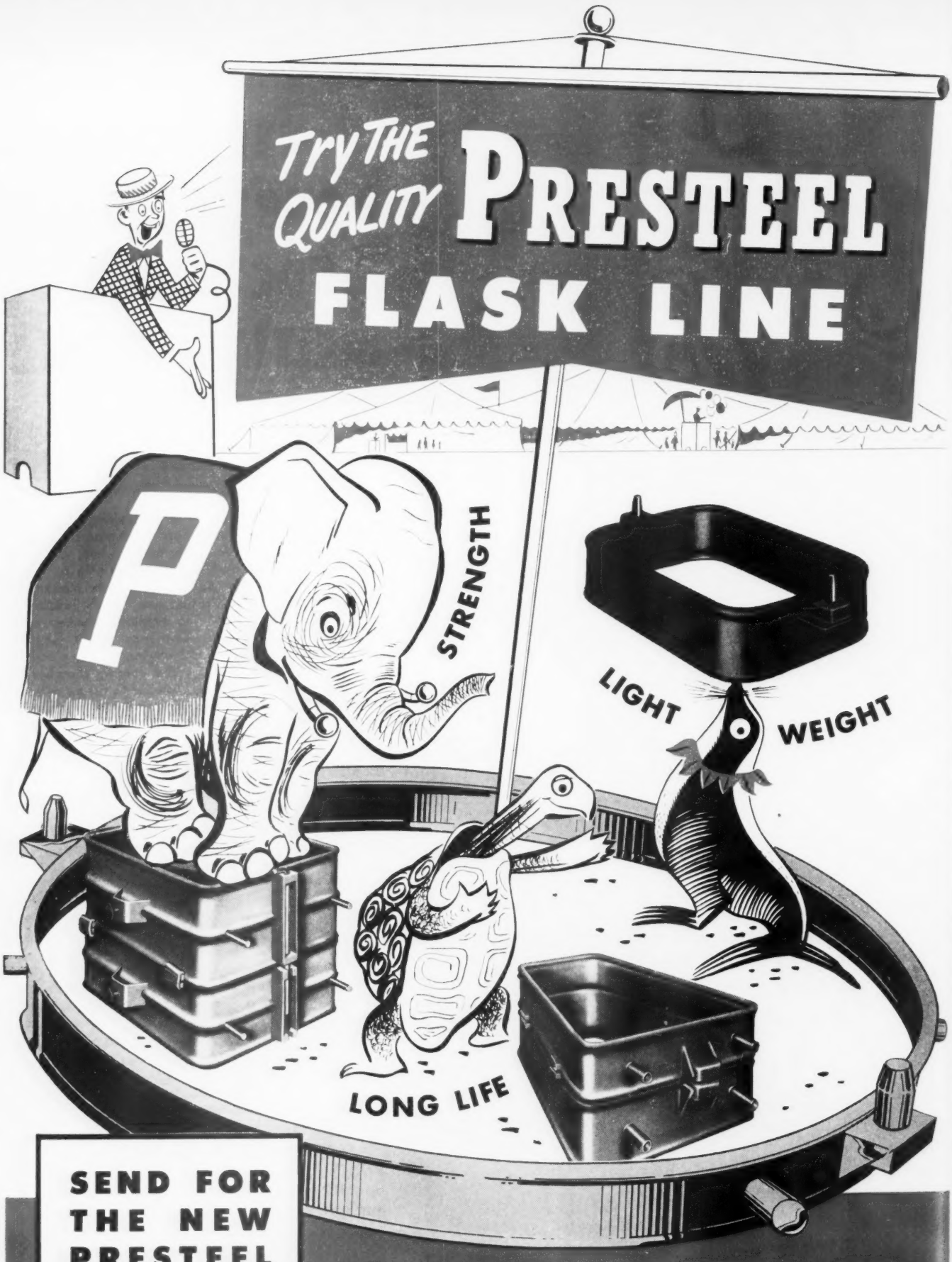

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Current Status of the Shell Molding Process

This report released by the U. S. Department of Commerce, recounts major developments in shell molding since the time Johannes Croning filed his patent application in Germany. It describes the present status of the process as regards both technical procedures and patent implications. The report was first presented at a meeting of the Government Precision Casting Committee held at the Alloy Engineering & Casting Co., Champaign, Ill., Apr. 17-18. Additional copies may be obtained from the Office of Technical Services, Department of Commerce, Washingon, for 25 cents. The Office of Technical Services has indicated it would welcome comments or suggestions for incorporation in subsequent revisions.

By ROY W. TINDULA
Chief, Metals and Minerals Section
Office of Technical Services
U. S. Department of Commerce
Washington

A PROCESS of manufacture of foundry molds and cores for cast metals having intricate contours, thin sections, and very smooth surfaces developed recently makes possible the production of precision cast components in larger sizes than formerly considered practicable.

Thin shell-molds are formed by adherence of a mixture containing dry sand and plastics to heated metal patterns. Each shell mold is then hardened by further polymerization of the plastic bond on short heating in an oven with the pattern still attached. After removing from the oven, the molds are stripped from the patterns, clamped together in pairs in a box, backed with loose metal shot or other porous material, and filled with molten metal.

Quality of Casting—This process features direct casting of larger intricate parts to finished shapes at lower cost than now seems possible by lost-wax or lost-mercury methods of investment casting. It does, however, require the assembly of two mold halves along a parting line and therefore could be liable to dimensional errors produced in removing metal fins along this line or from mold or core shifts that would not be encountered in the former practices.

The need of use of both pattern and mold after their separation also makes it mandatory that customary draft angles be provided in designing the casting on all surfaces vertical to the parting line. Investment methods of precision casting permit somewhat greater latitude in design since some draft problems can be avoided by forming the mold cavity from an assembly of composite pattern pieces. (Waxes or mercury pattern pieces are easily welded by heat or pressure into a single pattern of greater complexity).

The investment casting methods may also permit a closer reproducibility of dimensions or precision in thousandth inches per lineal inch. The shell-mold process permits much larger batches of metal to be melted and cast, consequently more uniform and reliable chemical analysis and physical properties should be possible in the metal product.

Ferrous metals may be economically cast with good surfaces in these silica sand shell-molds. For these metals a violent chemical reaction will result if an attempt is made to pour into plaster molds, while die casting is not practicable because of rapid erosion and early failure of die materials. In the casting of many nonferrous metals, however, shell-molding is competitive with plaster or die casting in the mass production of smooth castings for use where little or no finishing is required.

The principal molding method for solid sand-casting packs damp sands by jolting, squeezing, or sandslinger machines, or by hand ramming. The action of compacting the molding sand mixture assists in providing enough adhesive strength to permit assembly of the mold halves but, at the same time, reduces the permeability of the mixture. To provide passage for the gases generated at the mold face by molten metal and to avoid scab defects in cast metal it is necessary to use a fairly coarse sand such as AFS grade 50 to 100 fineness.

The shell-molding process can use a finer sand such as AFS grade 150 with adequate permeability since the sand packs less densely as it drops lightly upon the heated mold. The finer sands used produce a smoother cast surface. The plastic materials bonding the sand grains of shell molds are decomposed at comparatively low temperatures and allow the mold to collapse with less tendency toward hot tear cracking of the casting than generally exhibited by the clay bond used in the common sand casting processes. Both processes are readily adapted to rapid mechanized molding methods.

Relation to Other Industrial Processes—The preparation of ceramic pottery bodies by the slip process in which slurries of refractory material are cast into plaster of paris molds and the excess dumped after a shell has set, is illustrated by a schematic diagram in a standard Chemical Encyclopedia[33].

A clay slip[34] may remain in the molds for from one to two hours in order to obtain proper wall thickness (about 0.4 in.). After pouring out the excess, the shape is allowed to remain in the mold overnight, after which it has attained sufficient green strength to be removed. After trimming and smoothing, inserts and external parts are joined.

The shaped ware is then dried for six to eight days at a humidity of 60 to 70 per cent and fired. (Chemical formulae for clay bodies are given in this reference). Fire clay sanitary ware is similarly formed in plaster molds.

For sillimanite ware[35] articles, 0.5 per cent of water glass is added to the slip. The required water content is 23 per cent. For alumina ware[35] a slip is made from 100 kilos of ground calcined alumina, 45 liters of water, and 5 liters of hydrochloric acid (4:1).

In each of the above examples, a shell is formed as the slurry is dried

out by absorption of moisture by the plaster of paris mold. The mold is then inverted at the proper time and excess slurry drops out by gravity. The slip casting is kept in contact with the mold for an additional period to further consolidate itself sufficiently for handling before removal from the mold and then firing to full strength.

In a similar process of slush casting, liquid metal is poured into a mold until an inner shell of frozen metal forms and then the excess metal is poured out by inverting the mold over a suitable container.

All these processes are similar to shell molding in dropping a mixture into a mold, forming a solidified shell, and dumping excess material by means of gravity at the correct time. There are differences, however, in forming the shell as follows. Slip casting of refractory slurry absorbs the liquid by capillary and chemical action, slush casting of molten metal extracts heat by a cold mold, and the "C" process of making shell molds adds heat from a hot mold to polymerize and thereby harden the bond of a dry refractory mixture.

Patent Developments in Germany—This method of making thin shell molds and cores for smooth, accurate casting of metals was developed during World War II by Johannes Croning of Hamburg, Ger. . . patent application[1] (No. 48679), filed in the German patent office on Feb. 1, 1944, on the process of casting hollow cores, mold skins, and molds of any kind with thin and approximately uniform wall thickness. As described in the patent, perfectly dry and freely flowing material is mixed with a dry synthetic resin and with a dry hardening agent. This mixture is poured upon the mold heated to approximately 200° C. It is removed after 2 to 5 seconds.

Because of the heat of the mold, the outer layer of the poured-in substance becomes soft and cohesive so that it adheres to the walls. This layer becomes hardened in a few minutes by the heat emanating from the mold, or by additional heat, and can be removed from the mold as a firm skin or hollow piece. The poured-in substance consists of an inorganic, free-flowing material such as sand or similar agents, with approximately 3 to 6 per cent of synthetic resin, and hardening agent.

The patent claims also include a filling material composed entirely or partially of metal powder, metal oxides, graphite, or similar agents, as well as sand. The patent application was kept in a secret status by the German government. The document was copied in microfilm at the end of the war by allied technical intelligence and is filed as PB-83891 (in German)[1] at the Library of Congress, Washington.

Croning had experimented earlier and patented, or applied for patents, on other flowable mold materials, containing clay, resin, and foam-forming bonding agents. Then, he tried thermosetting plastic resins in dry form as described in the above patent application. The mechanical method of filling, forming the shell, dumping excess material, and then hardening the shell, resembles slip casting of ceramics and slush casting of metals. However, a different material, bonding agent, physical hardening method, and end use are characteristic of the Croning patent application.

This process was examined by W. W. McCulloch,[2] a member of a United States technical intelligence team of the Department of Commerce, on April 24 and 25, 1947, and the technical details originally published as FIAT Final Report No. 1168, dated May 30, 1947. This report is now

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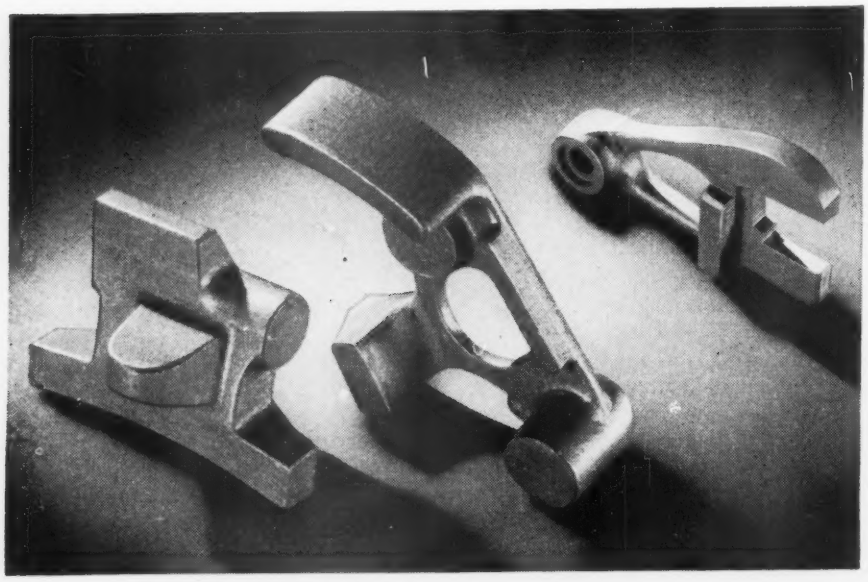

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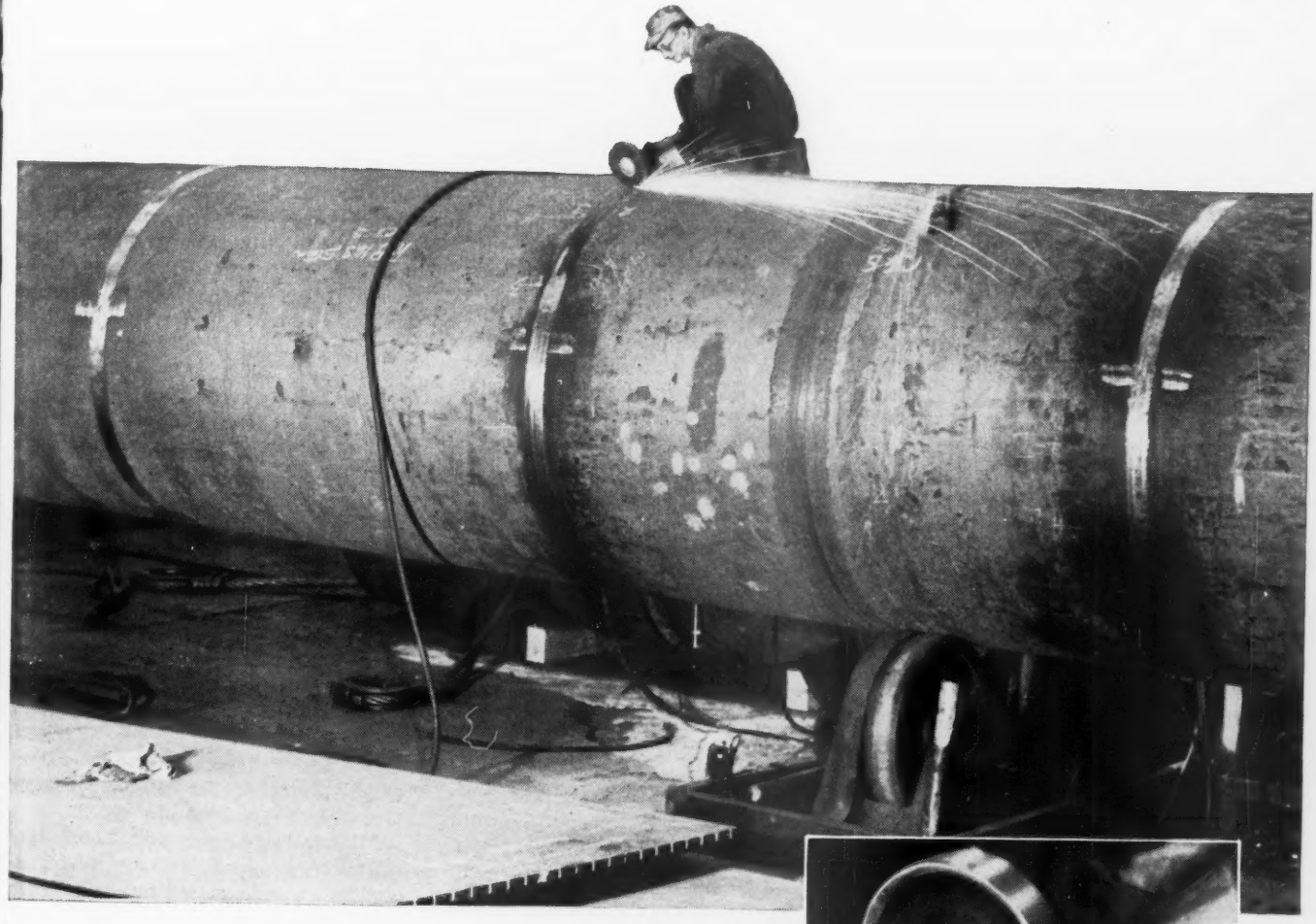

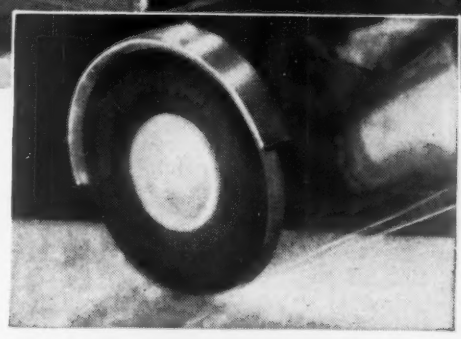

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(*Continued from page* 202)

available in the general Publication Board collection of reports of governmental agencies as PB-81284 in mimeograph form at 25c from the Office of Technical Services.

Already in June 1944[4] the process had been established successfully at a number of places, particularly for the production of cores. For example, the firm of Haller Werke A. G. in Hamburg-Altona was producing the cores for 8 cm hand grenades by the Croning process and had reached a capacity of 6000 components per day.

U. S. Patent Developments—Processes employed by Germany during World War II and up until Jan. 1, 1946, were considered by the Allies to be in the public domain, freely available to industry and therefore not patentable in the United States or any other allied nation.

The assignment files of the U. S. Patent Office reveal that one J. Croning filed applications for patents[3], dated Dec. 3, 1947, assigned to the Crown Castings Corp., Philadelphia, on foundry molds and cores and on the process of manufacture.

The policy of the U. S. Patent Office does not permit the release of either technical details or disposition of applications for patent. Since no patents have been granted on either of these applications they may be still pending, they may have been abandoned, or they may have been finally rejected. The Crown Castings Corp. has not seen fit to disclose the subject matter or disposition of the patent applications.

The declaration that the process as disclosed in the German patent application is in the public domain saves any user from liability for infringement. Naturally, if a U. S. patent, or patents, should be granted on *specific improvements*, an industrial user must not employ such improvements without obtaining a license from the patent holder.

Normally, a patent comes into effect on the date of issue. Therefore, in the absence of special contract obligations, a company which uses a variation of the process which is later claimed in valid U. S. patent, is not charged with infringement for the use prior to the date of issue.

The A. R. D. Corp.[18], New York, has developed an investment slurry incorporating a low-temperature bonding agent (urea, melamine, furane, or phenol-formaldehyde resin), a high temperature refractory bond, and a catalyst to polymerize the resins. A patent application was made, Serial 664,420, Jan. 30, 1946, and patent 2,521,614, Sept. 5, 1950, granted to I. E. Valyi, incorporating the low temperature bonding agent. Moisture contents by this method can be reduced to 2-2½ per cent.

The Croning process apparently differs in employing a *dry* mixture of resin bond silica to pour against a hot pattern which may then be heated to harden the bond.

Technical Methods—The technical methods employed in this process, as well as relative fields of application and advantage relative to other processes, have already been discussed briefly in this report. These details have been more fully described and illustrated by photographs and diagrams in some of the 33 public publications listed in the bibliography at the end of this paper, as well as in other sources.

Refractory Materials—Sand[2], free of clay and metal oxides, moisture, and organic matter, and with round grains of uniform size estimated at AFS 90 to 100, is used.

Clean, white, Ottawa silica sand[5], with an AFS fineness of 130-140 has given good results as compared with other sands. To get a clean and smooth surface on the casting, the sand should be finer than 90, but sand of 230 fineness gives much lower tensile strength than 139. The use of a cleaner sand may prove more economical, even if itself more expensive, because of the substantial saving in resin it makes possible.

Experiments[7] with 103 AFS sand produced good surface and required 8 per cent resin bond, while 151 AFS sand produced very smooth surface but required 9 per cent resin bond.

The sand[16] employed should be washed and free from clay, metal oxides, organic matter and moisture. A round, uniformly grained sand of 100-150 AFS fineness is preferred.

Best results are achieved[17] with AFS 95-150 sands (preferably 120 to 150). Recent tests show that bank sands, not exceeding 1 per cent clay content are satisfactory. (Caution: higher clay content cuts strength and permeability of bond).

AFS 90 to 230 sand[26] with under 3 per cent clay content may be used.

The AFS number of a sand refers to its median sieve size of grains. As the number rises the sand becomes smaller in grain size, the casting surface becomes smoother, but the permeability of the sand is lowered rapidly.

Natural clay and bentonite additions to silica sands serve as binders in ordinary molding practice. They should, however, be avoided in shell-molds because they decrease the baked strength of resin-bonded sand. The bonding effects of clay and bentonite are not additive to the bonding effects of resin or core oils but, on the contrary, decrease their effectiveness.

Bonding Materials — The plastic binder[2] is composed of phenol resin (90 per cent) and hexamethylene tetramine (10 per cent). The binder is prepared by grinding the two materials simultaneously in a ball mill to pass a 102-mesh sieve. It is added in 6-8 per cent by weight to 92-94 per cent by weight of dry sand.

Two phenolic resins[5] of the "two step" and one of the "one step" type of different flow and melting points are described. The powdered resin ordinarily is finely ground to pass 99 per cent through a 200-mesh sieve. Five per cent of the resin is used with a clean AFS 135 sand, but the proportion varies with sand size, type and amount of fines.

Examples of recommended proportions[16] of Bakelite, Durez, and Borden powdered phenolic resins (5 to 10 lb), and wetting agent (0 to 8 oz), for use with silica sand (100 lb) of AFS 110 to 150 fineness in molding mixtures for producing aluminum and bronze casting are given.

The proportion[17] of resin to sand varies from 3.5 to 7.0 per cent according to sand grain size and strength needed in the cured mold.

In a comparison of one and two-step resins[7], the one-step resins containing an excess of formaldehyde in their preparation were preferred in making aluminum alloy and other metal sheaves and test plates. Hexamethylene-tetramine, employed in the two-step formula, decomposes on heating to formaldehyde and ammonia to catalyze cross-linking polymerization of the original resin compound composed of linear polymers.

Resins[26], 5-9 per cent of weight of sand, preferred for malleable iron, are of two-step formula types.

Mixing Refractory and Bond—The mixture[22] of silica sand and resin, including the accelerator, are then mixed in a conventional foundry muller with the wheels approximately ½ to 1 inch from the pan. Generally, 15 minutes' mulling time is sufficient with a fresh unlumped resin. Longer mulling is required with lumpy resin. The milling operation is a fundamental step, since proper blending has a very important relation in obtaining satisfactory mold quality.

Pattern Plates — Metal patterns[2] must always be used, with cast iron recommended. The pattern is heated to 360-400° F. Pattern plates have been made[5] of cast iron, steel and aluminum, with prints of same or different metals. The finish on a casting can be no better than the pattern finish from which it is produced. Heat-treated cast iron patterns are

(*Continued on page* 206)

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(*Continued from page* 204)
preferred for long-run productions. The temperature of the pattern is brought to 400-500° F in an oven.

Cast iron patterns[7] at 360-400° F were used.

Polished hollow,[16] gray iron or aluminum patterns, about 9/16-in. thick, are heated to 400-550° F.

Cast iron[17] containing approximately 3.65 per cent carbon and of uniform wall thickness held at 300-500° F is probably best for patterns for general use. The following relation of pattern temperature to time required to form a shell 3/16-in. thick is given for one resin, as follows:

Temp., °F:	300	350	400	450
Time, (sec.):	21	12	10	7

A contact pyrometer is used to measure pattern temperatures.

For long production runs[22] a low expansion alloy cast iron or a "non-shrink" steel is used at 500° F.

An experimental pattern[31] of aluminum was used at 400° F.

Mold Release Agent—The pattern[2] at 360-400° F is sprayed with a paraffin solution, at which temperature the paraffin remains liquid and provides a uniform, oily film.

A silicone jelly[7] (15 per cent by weight) dissolved in methyl ethyl ketone, naphtha, or carbon tetrachloride solution and sprayed on the pattern, almost completely eliminates the mold-sticking encountered when using a paraffin solution.

A list of suppliers of suitable mold lubricants[16] to prevent sticking of the sand-resin mold is given. Ten per cent of DC-7 silicone dissolved in carbon tetrachloride is sprayed on the cold patterns and the hot patterns, as necessary, after cleaning the pattern with a fine, soft, wire brush.

A schedule[22] for conditioning the mold for easy parting with a 5 per cent silicone in water emulsion is described.

Forming the Shell Mold—The heated pattern plate[2] is clamped, pattern downward, over a box containing the molding material. The assembly is inverted, building up a coating of 3 to 4 millimeters (⅛-in.) in about 6 seconds. Then the box is again turned over, and the excess molding material falls away from the soft coating.

Improvements[18] adapting the shell-mold process better to quantity production include: Improved mold lubricants, adjustment of the sand-resin mixtures for more rapid curing, and design of an automatic machine. A machine is claimed to apply parting compound, preheat the pattern, form the shell mold, cure the mold, strip the mold, and clean the pattern for the next cycle, in 50 to 70 seconds. An SU-1 machine, produced by the Shell-Mold & Machine Co. Inc., associated with the A.R.D. Corp., requires only a single operator.

Curing the Mold — The pattern plate[2] with the adhering coating still intact is placed in an oven at 570° F for 2 or 3 minutes. Curing[22] is generally accomplished at 600° F for 1 minute.

Stripping, Assembling, and Metal Casting — Upon coming[2] from the oven, the half-mold is easily stripped from the pattern plate by means of lifting pins. Two half-molds are pasted together, held vertically in a box and the surrounding space is filled in with steel shot or some other suitable bedding material.

These operations are illustrated[5] by photographs which illustrate also the methods employed to eject the mold from the pattern and to insure exact registry of mold halves and obtain the high dimensional precision of the process.

It was claimed[2] that the rate of solidification of the liquid metal could be controlled by varying the type of

(*Continued on page* 208)

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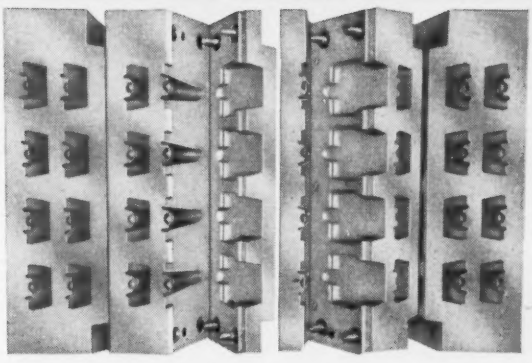

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(*Continued from page* 206)

bedding material used. However, no claim was made for directional solidification.

A washed and graded roofing gravel[31] is inexpensive and accessible, and as efficient as steel shot for backing material. (Sand is claimed to lack the necessary porosity for use as backing).

Dimensional Accuracy — Castings are produced[2] with clean edges, true dimensions, and unchilled surfaces. Molds and cores are claimed equal to new permanent metal molds in smoothness.

Tolerances[17] of .002 to .003 in. are possible. Castings[22] have been held to tolerances as close as plus .003 to .007-in. per in., resulting in less machining waste.

Metals and Size Limitations—Castings[2] in iron, steel, and aluminum from the size of a signet ring to 6- to 8-pound pipe fittings were inspected.

Castings[7] of sheave-type wheels, radiographic test plates, and impellers with knife edges were made satisfactorily in aluminum, bronze and cast iron. Carbon and stainless steel castings had shrinkages in the impeller hub and the knife edges were incompletely filled.

Shell molding[33] is now used for automotive parts (formerly fabricated, forged or cast), railroad castings, boiler sections, aviation castings, plumbing fittings, pressure pipe, and many other products. Shell molding is particularly well suited to aluminum; gray, nodular and malleable iron; low-leaded, low-tin bronzes, and high alloy steels. Limited but encouraging work on magnesium incorporates inhibitors in the resin sand mix. Lead sweating of high-leaded bronzes continues to be a problem. Previously, 20 to 30 pounds were considered an upper limit (of weight) but now castings over 200 pounds are made.

Among the principal suppliers of synthetic resin binders in the United States are: Bakelite Division, Union Carbide & Carbon Corp., 30 East 42nd St., New York 17; Durez Plastics & Chemicals Inc. 127 Walck Rd., North Tonawanda, N. Y.; Borden Co., Chemical Division, 350 Madison Ave., New York 17; Monsanto Chemical Co., Plastics Division, Springfield 2, Mass.

Present Status of Process—With the rapidly increased use of the process during recent years, improvements have resulted principally in faster and better handling equipment, more rapid curing of the shell-mold, easier stripping of the mold from pattern by improvement in parting agents, and extension of the process to more metals and larger castings. Many commercial products of relatively large size are now being cast accurately with such a smooth surface, near enough to final dimension, that little or no machining is needed.

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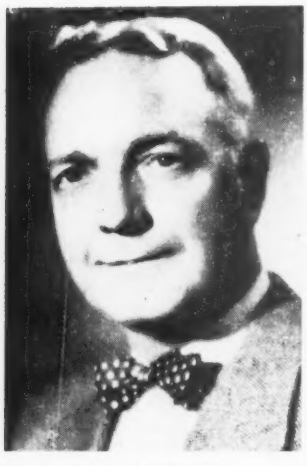
(*Concluded on page* 210)

NATIONAL CASTINGS COUNCIL ELECTS OFFICERS

ANNUAL meeting of the National Castings Council was held in Atlantic City, May 5. H. A. Forsberg, Continental Foundry & Machine Co., East Chicago, Ind., and president of the Steel Founders' Society of America, was elected president of the council. A. V. Martens, Pekin Foundry & Mfg. Co., Pekin, Ill., and president of the National Foundry Association, was re-elected council vice president; F. Ray Fleig, Smith Facing & Supply Co., Cleveland, representing the Foundry Facing Manufacturers' Association, was re-elected treasurer; and Frank G. Steinebach, FOUNDRY, was re-elected secretary.

The council heard I. R. Wagner, president of the American Foundrymen's Society, report on progress of the safety and hygiene program of AFS, and pledged continued support through member societies to the fund-raising program for that project. Emphasis was placed upon the importance of the program and the need for full industry participation.

Success of the International Foundry Congress and Show; which was in progress at the time of the annual meeting of the council, was commented on by the various representatives on the council. The following resolution praising the affair was adopted unanimously: Resolved, that President Seelbach, Vice President Wagner, Secretary Maloney, Technical Director Massari, Convention and Exhibit Manager Hilbron and the staff of the AFS be commended highly for the success of the 1952 International Foundry Congress and Show at Atlantic City, with special emphasis on the general arrangements of the entire week's program, the splendid exhibition of foundry equipment and supplies, the excellent program of technical papers and discussions.



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Effect of Raw Materials on CUPOLA OPERATION

By BERNARD P. MULCAHY
President
Fuel Research Laboratory Inc.
Indianapolis

Precautions to observe in the use of steel scrap and foundry returns in the cupola metal charge are detailed in this fourth of a series of articles on cupola raw materials

THE early use of steel scrap in a cupola mix was initiated because of its availability and at a lower price than gray iron scrap. It was quickly discovered, however, that its benefits to a mix exceeded the initial price advantage because of its effect on carbon control and metal structure, and today it is universally used for this purpose.

Generally the steel scrap employed for the cupola will have an average carbon content of approximately 0.6 per cent which when compared with average gray iron scrap of around 3.20 per cent gives a lower carbon advantage of around 2.60 per cent for equivalent amounts. For lower carbon high-strength iron or malleable iron it is quite obvious that steel in the mixture is highly essential.

While the above examples represent high steel mixes, its use is not confined to these levels. Actually the use of steel today varies from 0 to 100 per cent of a cupola charge depending upon the charcteristics of the metal desired. In addition to its pronounced effect on carbon reduction, steel in the mix produces a finer grained iron with its attendant improvement in machine finishing and strength.

Although steel is generally used for a definite control of carbon levels for a particular mix, it has also found wide application for controlling carbon levels to offset fluctuations in operations or materials. For example, poor coke frequently results in lower carbon than desired, and if steel is used in the mix an adjustment in the amount used (lower) can be made to restore the carbon to its proper level. This factor of carbon absorption will be more fully discussed later.

Several of the factors previously discussed in connection with gray iron scrap also apply to steel, and in certain instances are exaggerated in the case of steel. These factors therefore are discussed individually.

Size—The previous discussion of this factor in connection with gray iron scrap also applies to steel and for the same basic reasons—permeability of the charge and heat absorption.

In addition to normal sizing characteristics we have several other shape factors peculiar to steel as a scrap. These are thin bundle stock, heavy croppings, pipe, plate, bars, forgings and rail.

Several of the above obviously need cause no particular concern by themselves, but because of their availability in tonnage quantities we can readily see how a small problem may be multiplied. In other words, if the source of scrap steel is from a local plant large quantities of one particular type of steel may be suddenly made available to a foundry formerly using another type.

The use of heavy croppings, of course, must be limited to the ability of a particular cupola to digest it in the same manner that heavy runners or risers must be limited.

Thin steel (can stock for example) cannot properly be used in a cupola even when compressed or bundled. This material is satisfactory for an open hearth furnace, but melting conditions between these furnaces are vastly different.

Steel plate either thick or thin must be used in the cupola cautiously and with care. Small amounts, of course, do little harm in a mix, but when the percentage of steel becomes a sizable proportion of the charge (above 25 per cent) and all of the steel is plate, we can quickly see how this material will (or can) form a blanket on each charge and prevent the proper distribution of the gases.

Rail stock has always been regarded as an excellent steel scrap. Its individual shape and potential uniform sizing lend itself ideally.

Pipe, if clean, can be classed as good a material as rail.

General miscellaneous steel (scrap yard accumulations) is considerably more hazardous than the individual steels previously mentioned because of its indeterminate character and size.

Rusty or dirty steel is just as objectionable as dirty gray iron, and can bring about the same difficulties with oxidation as mentioned earlier. Pipe particularly should be scrutinized for undesirable inner deposits and trapped water or ice (in the winter). This latter can cause "explosions," a hazard both to the charging crew or the equipment.

Borings—Steel borings must be considered by themselves because of their very individual characteristics. The previous section discussing gray iron borings pointed out the undesirable features of this material and the pronounced effect of lower carbon and silicon. With steel borings these conditions are aggravated because of the initially lower carbon of the steel. This material therefore is not recommended as a general source of steel scrap.

We have repeatedly emphasized the necessity of proper sizing of material for optimum cupola operation. We do not mean that this sizing should exceed a practical standard, but at the same time it cannot be completely ignored.

Many shops have neither the means nor personnel to ideally size their scrap, but all shops can control to a large extent the materials purchased and used. For example, assume that with steel scrap tight and supply uncertain, several loads of good clean plate are offered to a shop and no other material can be readily obtained; so this material is purchased. But how shall it be used? To avoid "leafing" or "fish scaling" a small amount should be distributed on each charge or it can be added to the charge in two portions with the gray iron in between.

Poor fuel or limited pig iron supply invariably aggravates the difficulty of metal control so that under these conditions we must be even more aware of the inherent characteristics of the material charged, and

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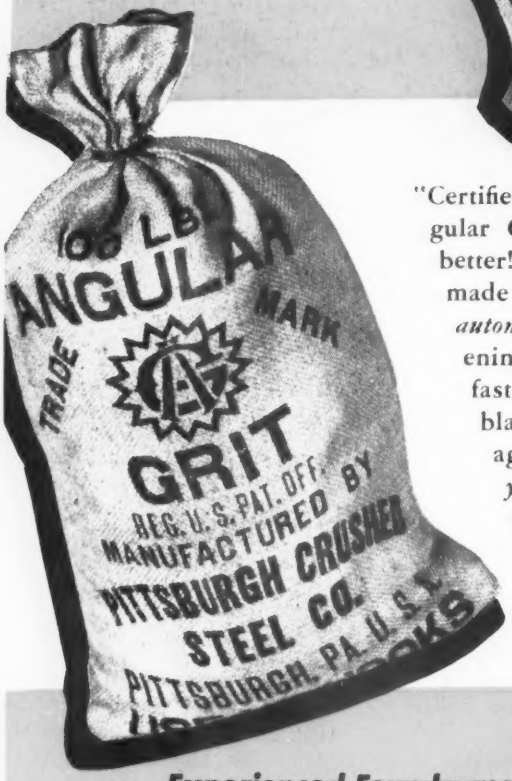

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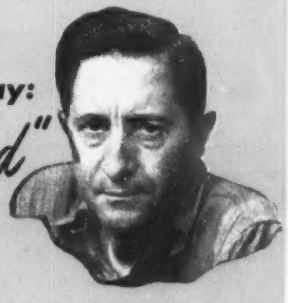

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steel can cause considerable trouble if we do not compensate for it.

Returns—Although returns occupy a unique position as a component of the metal charge by virtue of their known composition and origin, they have their own peculiar nature which must be considered.

All too frequently a shop producing several kinds of metal disregards the native variations in the sprue and returns in making up the charges. To illustrate, assume the shop produces both regular gray iron of a composition of 3.40 per cent carbon and 2.20 per cent silicon, and additionally a higher strength iron of around 3.00 per cent and 1.80 per cent silicon with possibly some chrome or molybdenum added. It is quite patent that for best control the sprue and returns from both metals should be kept separate and charged to the individual cupolas producing the respective irons.

Easy To Lose Identity

Unless the plant has set up a rigid procedure of processing each type (grade) of casting through the shop it is very easy to lose the identity to a point where a variable mixture of the returns results.

In considering the two types of iron we note that the high strength iron has 40 points less of both carbon and silicon, and if the returns constitute 40 per cent of the charge we can have a variable charge content of 16 points of both carbon and silicon.

This variation of 16 points of carbon and silicon can be quite serious in the effect on the metal both high and low, particularly if the pig iron content is already low because of supply shortage. This effect will become apparent when particular castings already critical begin to show heavy losses because of poor pouring conditions, etc.

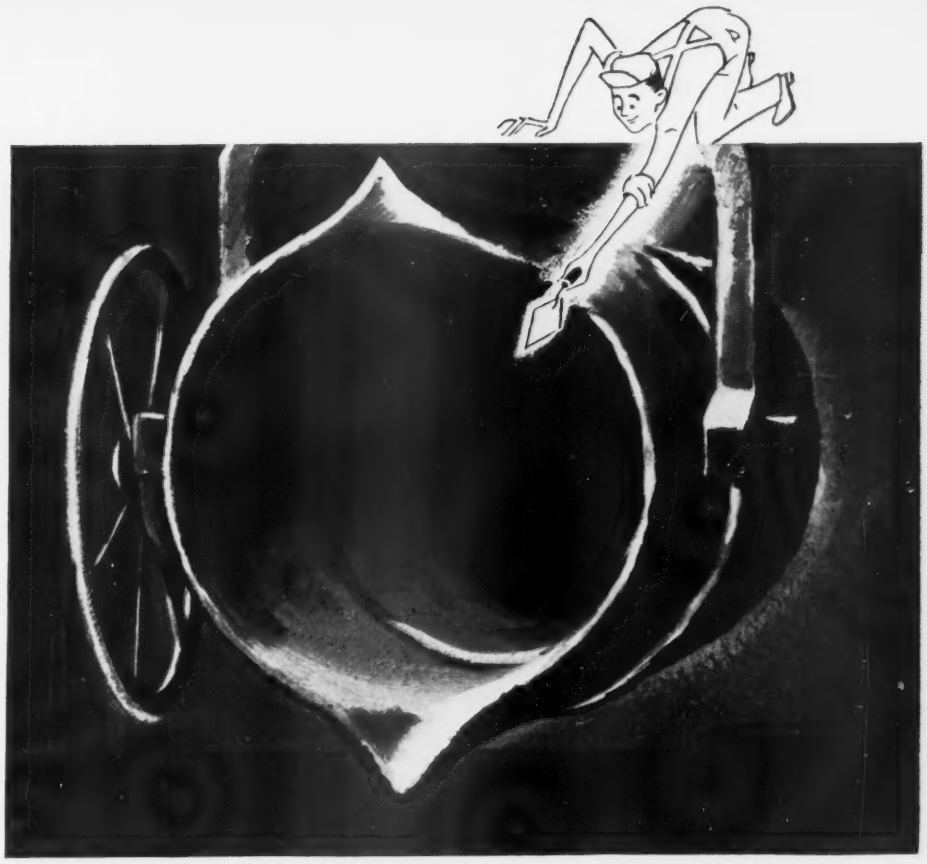
The above illustration is not an exaggeration, but actually is a conservative example of disregarding returns composition. Fortunately this condition can be corrected almost completely by a little study and rearrangement of handling of the materials through the shop.

Another source of variation of metal composition and cupola trouble from returns is the manner in which the returns are routed to the cupola.

For several obvious reasons it is generally desirable to consume the returns as promptly as they become available. Usually the most pressing urge is that of shop space. This condition, however, can result in a very serious disturbance of the charge composition.

(Continued on page 214)

Apply refractories faster...



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Castings are cleaner—3X Blazecrete resists attack from molten metal. Particles of the lining will not cling to metal and become part of the casting.

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JOHNS-MANVILLE JM PRODUCTS

Johns-Manville BLAZECRETE

REFRACTORY LININGS

(*Continued from page* 212)

For example, if the returns from the previous melt are not immediately available to the charging crew, the mix is made up from purchased scrap. Later in the day the returns begin to arrive and immediately the mix is changed, returns are added and the purchased scrap is reduced. The odds that a direct substitution can be made with no compensation are against such a procedure. Size, composition and weight must be considered here just as well as in another substitution.

Again it becomes obvious that a correction consists of a proper schedule of regularly charging the returns instead of on an intermittent and irregular schedule.

A third factor in considering the problems attendant with returns is the size of runners, particularly where large castings are poured requiring a heavy feed. This is well illustrated by an actual example.

A plant pouring heavy machinery suddenly developed cupola trouble which resulted in regularly lower metal temperatures. This was sufficient to cause difficulty in pouring and the runners were correspondingly increased in size. The cupola trouble persisted and in consequence the runners were repeatedly enlarged.

To make a long story short, as the runner enlarged the cupola metal temperatures consistently lowered so that a decided worsening of conditions developed. Additionally these runners, weighing as much as 600-700 lb each, were not uniformly divided throughout the charges which, of course, aggravated the temperature loss during certain periods.

This situation was corrected by totally eliminating the large runners for several days, rebalancing the cupola operation to effect a normal metal temperature, and then gradually charging the large returns until they were consumed. Simultaneously the runner sizes were reduced to a normal dimension which the hotter metal permitted.

This example condensed in the telling is made to appear very obvious but it must be remembered that frequently a "sick" cupola is a long time in developing and the adjustment changes of pouring are made so gradually that recognition of cause and effect is delayed and obscured.

While the above is an exaggerated condition, it can easily be seen that several variations can occur which bear the same relationship, all of which emphasizes the necessity for a constant and reliable procedure of cupola control.

The last and probably one of the most insidious difficulties connected with returns is the amount of adhering sand on the sprue.

This problem is extremely variable and not necessarily universal. Some shops produce a comparatively small amount of sprue while others produce a relatively large percentage. The handling of the sprue in certain cases eliminates considerable sand while in others it persists right to the cupola.

Sand on sprue causes both an error in the weight of the metal charged, which is the minor factor, and introduces heavy amounts of siliceous material which affects the slag, which is the major problem. To further complicate our thinking, the addition of the sand can be either beneficial or a decided injury.

For the most part we are concerned with the effect of the sand charged on the slag composition and volume, and correspondingly the influence on the cupola lining.

We are well aware of the necessity of increasing the flux material with unusually dirty or rusty scrap. When heavy amounts of sand ac-

(*Concluded on page* 216)

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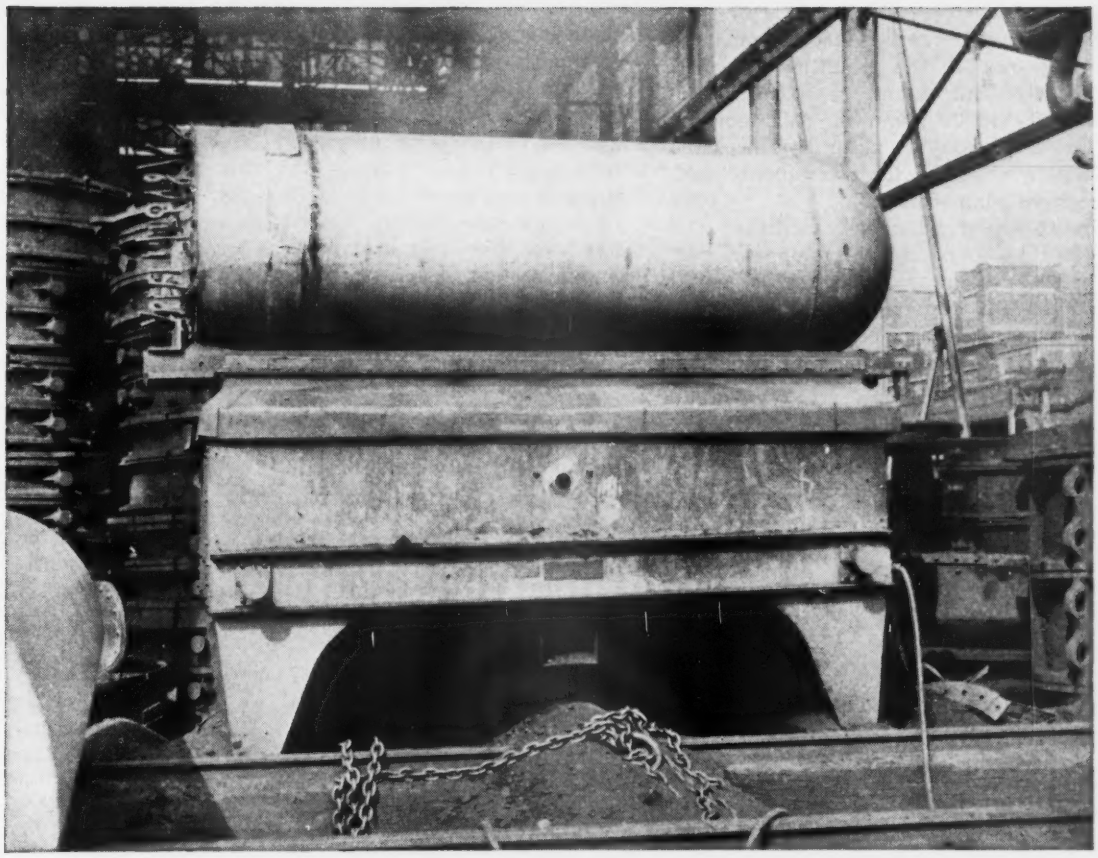

Saves 7½ Man-hours Per Casting

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That's the record set by a Hewitt-Robins Portable Floatex® Shakeout to completely knock out the core of this large casting at the Wilmington, Delaware, foundry of the Pusey and Jones Corporation.

These thin-walled castings of autoclave lines for paper mills are sealed at one end—weigh 8,000 pounds—measure 9' 5" by 40" diam. They are packed with a very hard core of cement-bonded sand weighing some 8,500 pounds. Although this Floatex Shakeout has been in operation for 30 months, not one casting has been damaged in spite of the terrific metal-to-metal impact during knockout and the speed with which the job is handled.

As a result of the time saved and the complete lack of casting damage, Pusey and Jones reports that this 72" x 120" Portable Floatex Shakeout paid for itself in just one year of operation!

This is but one of the many remarkable records that Hewitt-Robins Floatex Shakeouts are scoring in foundries throughout the country.

Floatex Shakeouts are genuinely full-floating—require no vibration dampeners. They shake the flask—not the foundry. The live frame and load both ride on soft, heavy-duty coil springs . . . springs that have served without replacement for five years and longer on units handling 35 tons or more.

Modernize your foundry technique . . . improve working conditions . . . make possible straight-line production with a Hewitt-Robins Floatex Shakeout—the foundry unit that enables you to perform *both* core knockout and flask shakeout—on the same machine, if necessary. Remember, Floatex is the only foundry shakeout available in *sizes* for 100 lbs. to 100 tons or more.

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(*Concluded from page* 214)

company the sprue, the flux must be increased or the resulting slag will be stiff and gummy, resulting in difficulty in its removal. This increase in slag volume naturally increases lining erosion with consequent higher patching costs.

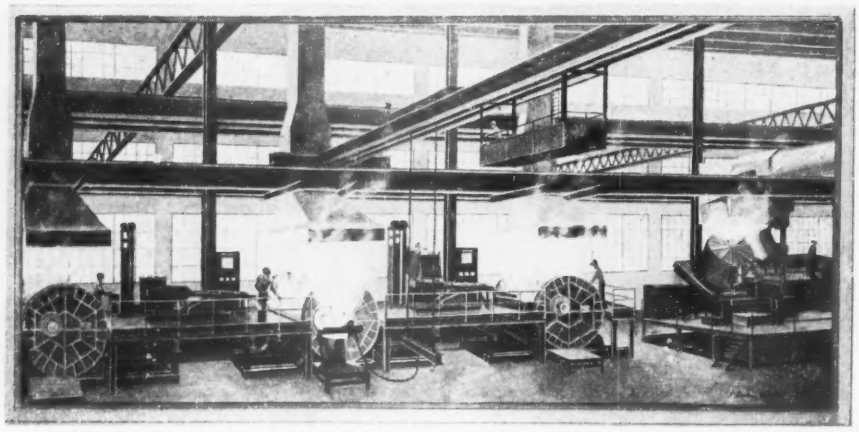
If the flux is not increased the slag is bound to stiffen up and possibly encourage a "bridge" with its attendant disastrous effect.

Under certain conditions the addition of sand can be very beneficial to cupola operation. This is true when the rest of the charge is unusually clean stock and only a small amount of flux is required. In this instance the sand may serve as the material to neutralize the flux. Sand is acidic and the flux is basic, and if the sand reduces the alkalinity of the flux, there is less opportunity for the flux to attack the lining. This balance has been effectively used to minimize lining erosion.

It is obvious that this problem of sand on sprue must be considered in each individual case, for in some instances it can be of serious concern while in others it may actually be insignificant.

Summarizing the handling of returns it is suggested that all returns be segregated and used in accordance with their various compositions and that they be equally divided throughout the charges rather than to permit a concentration at one period of the charge, and a complete lack in others. The piece size of returns must be treated in the same manner as all other scrap to avoid a concentration of heavy sections with the resultant depression of temperature.

AJAX INDUCTION MELTING FURNACES A NEW TOOL FOR INDUSTRY



This oil painting, 9 feet long in full color, by J. Gordon White, shows AJAX-SCOMET installation at Scovill Manufacturing Co., Waterbury, Conn.

Here is a new tool for melting metal . . . Something that can concentrate enormous power in a small space . . . Something that can be adapted to accurate pouring, to precise temperature control, to inert gas protection, to high grade refractories... A tool that can be used for all existing nonferrous metals and alloys.

Ajax furnaces paved the way for continuous casting processes which lay dormant in old patents of far-sighted inventors who thought ahead of their times. *Write us for further information.*

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AJAX ELECTRIC CO., INC., The Ajax Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

Modernized Foundry

(*Continued from page* 105)

Turnings and boring are collected and briquetted in a machine housed in a small building in the foundry yard. The turnings are compressed at 350 tons by hydraulic ram into tubular shaped briquets about 4 in. in diam. Aproximately 20-25 tons are produced daily. Briquets supply the foundry's need for cast iron scrap, making it unnecessary to purchase such scrap from outside sources. Steel scrap, however, is obtained on the open market.

Pig iron and steel scrap deliveries are unloaded from the cars by magnet mounted on a car type crane of 25 ton capacity. Metal stocks are stacked in the yard at convenient locations for subsequent use in making up cupola charges. Coke is delivered in drop bottom cars and unloaded by portable belt conveyor into drop bottom boxes of 4 tons capacity. Boxes are lifted by the crane, moved to either of two overhead storage hoppers in the foundry building, and lowered to the level of coke in the hoppers before the drop bottom doors are opened to release their load. Hopper bottoms are tapered to clamshell type discharge doors for releasing coke into cone bottom cupola charging buckets.

Making up of charges is not fully mechanized, but all ingredients are carefully weighed to maintain accurate control of iron analysis. A monorail charging crane elevates the buckets to charging door level and transports them to either of two cupolas through a switch in the monorail.

Metal charges weigh one ton and consist of 25-30 per cent high silicon (2.50 to 3.50) pig iron, 20 per cent steel scrap, and the balance briquets and returns. Coke charges are 310 lb and limestone, 75 to 80 lb. Cupola iron analysis is maintained at 3.25-3.40 C; 1.90-2.05 Si; 0.20 or less P,

(*Concluded on page* 218)

Results you can see ...in fume control

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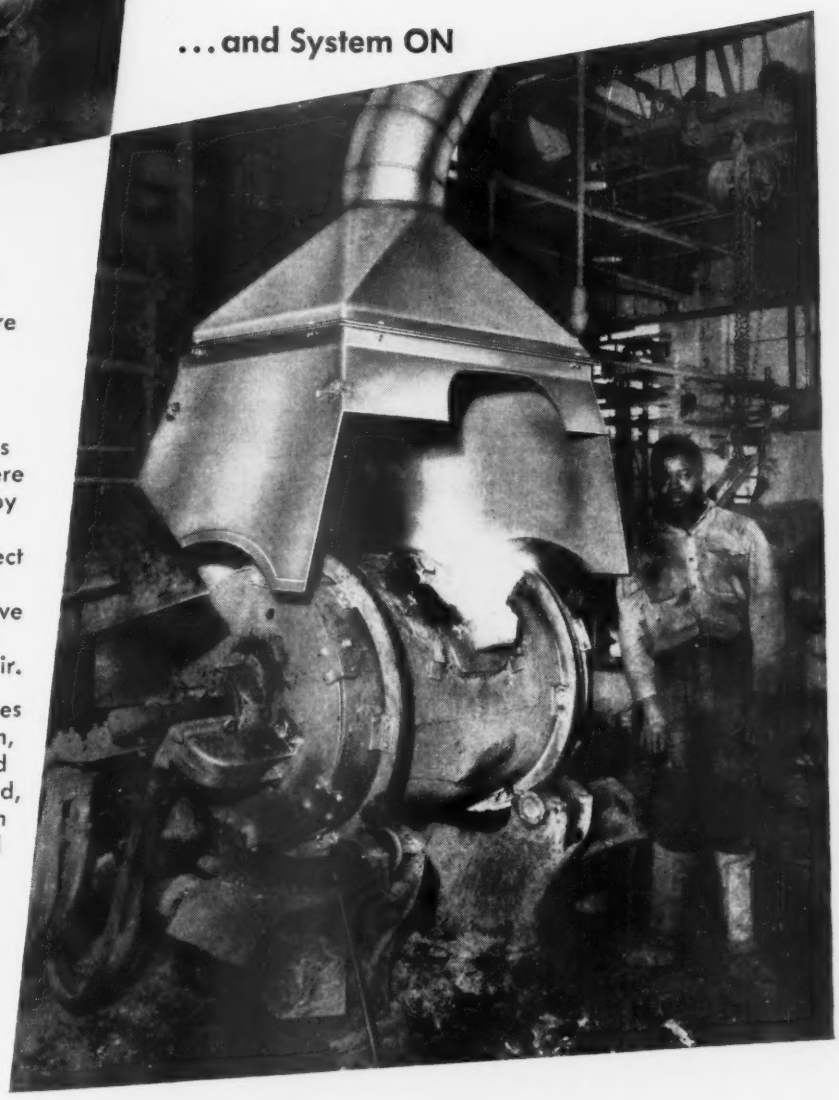
System OFF

...and System ON



In the plant of The William Powell Company, noted valve manufacturers, six distinct KIRK & BLUM installations control dust and fumes. Shown here are "before" and "after" views in the rotary electric furnace room where bronze is melted.

Before the installation, smoke, fumes and gases escaped to the room and were eventually discharged at the roof level by means of large volume exhaust. Now, localized hoods over each furnace collect the fumes as they are released. As a result, fume control is completely effective and working conditions are greatly improved with a minimum of exhausted air.

A unique feature of this system involves use of the injector principle. Fan-driven, the exhaust from one hood is injected into a venturi of air of an adjacent hood, creating an equal exhaust. Thus, one fan serves two hoods, reducing first cost and halving operating costs.

Hundreds of plants, large and small, have found it pays in *greater operating efficiency* to have dust and fume control systems designed, fabricated and installed by experts. For all three—design, fabrication and installation—call on K & B. For booklet showing typical foundry systems,

Write Kirk & Blum Mfg. Co.,
3108 Forrer St., Cincinnati 9, Ohio.

KIRK AND BLUM

FUME CONTROL SYSTEMS

"For Clean Air ...The INVISIBLE Tool"

(*Concluded from page 216*)

and 0.11 or less S. Temperature of the iron at the spout is 2800-2900° F. Keyhole type chill tests are made on the iron every 15 minutes and a chill of 5/16-in. is considered satisfactory.

Each of the two cupolas is lined to 54 in. ID, and they are used on alternate days. Average melt is about 80 tons per day, but on occasions it has gone as high as 115 tons. Cupolas are of the continuous pour, front slagging type. They are tapped into a 3-ton mixing ladle, the iron being desulphurized there with soda ash. Slag is drawn off into a sluice box carrying running water which washes the slag into a large container. Buckets on a continuous chain dredge the bottom of the container and dump the crystallized slag into a second container which is hauled away periodically by truck for dumping. The slag crystallizing unit is portable so that it can be used at each cupola.

During the noon hour when molders in the mechanized foundry and other foundry sections producing relatively small work are at lunch, a harder iron is produced in the cupola, separated from the usual mix by extra large coke splits at beginning and end of the run. This iron is used for pouring some of the larger work and one-of-a-kind castings molded in what the company terms the south foundry.

This foundry is located in a long, rectangular bay with the cupolas at one end and sand preparation equipment at the other end. Molds are rammed by a sandslinger electrically driven along a narrow-gage track laid in the middle of the bay over its entire length.

Heap sand around the muller is picked up by a scoop-equipped industrial gasoline truck and dumped on a vibrating screen at approximately floor level. The screened sand ready for reconditioning is transferred to a skip hoist bucket of 1500-lb capacity. Bucket is hoisted to floor level where proper additions are made, then continues up and dumps into the muller. Upon completion of the 1½-minute mulling cycle the sand is discharged to a 24-in. belt conveyor which carries it up to a 25-ton capacity bin mounted on a structural steel framework over the sandslinger track. The 10-ton sandslinger bin is filled from double spouts under the larger bin.

The sandslinger rams molds along the track. As each mold is rammed it is lifted by jib crane and placed on a gravity roller conveyor leading to the pouring side of the foundry bay. Molds are poured by ladles suspended from a five-ton bridge crane traveling the length of the foundry bay. When cool molds are lifted by the bridge crane and shaken out on the floor. Flasks are placed back on the conveyors for return to the molding area and castings are removed by truck to the cleaning department. The scoop-equipped truck carries the sand back to the storage pile.

FOOD ON THE JOB: How to provide good, hot food on the job when it is not practicable to provide a central cafeteria, poses a problem for some foundries. One large foundry in the Chicago area found the answer. A catering company was hired to prepare simple food in a kitchen on the premises and truck it to two small enclosed frame canteens in the foundry where it is dished out as ordered. Paper cups, plates and containers streamline the service, eliminating dishwashing. Lids on cups dispensing liquids, as above, and on containers for food protect the contents against dirt. The company discovered that the workers would rather buy a hot lunch than munch on a cold sandwich brought from home, and the system has proved popular

Recognize Need for More Foundry Apprentices

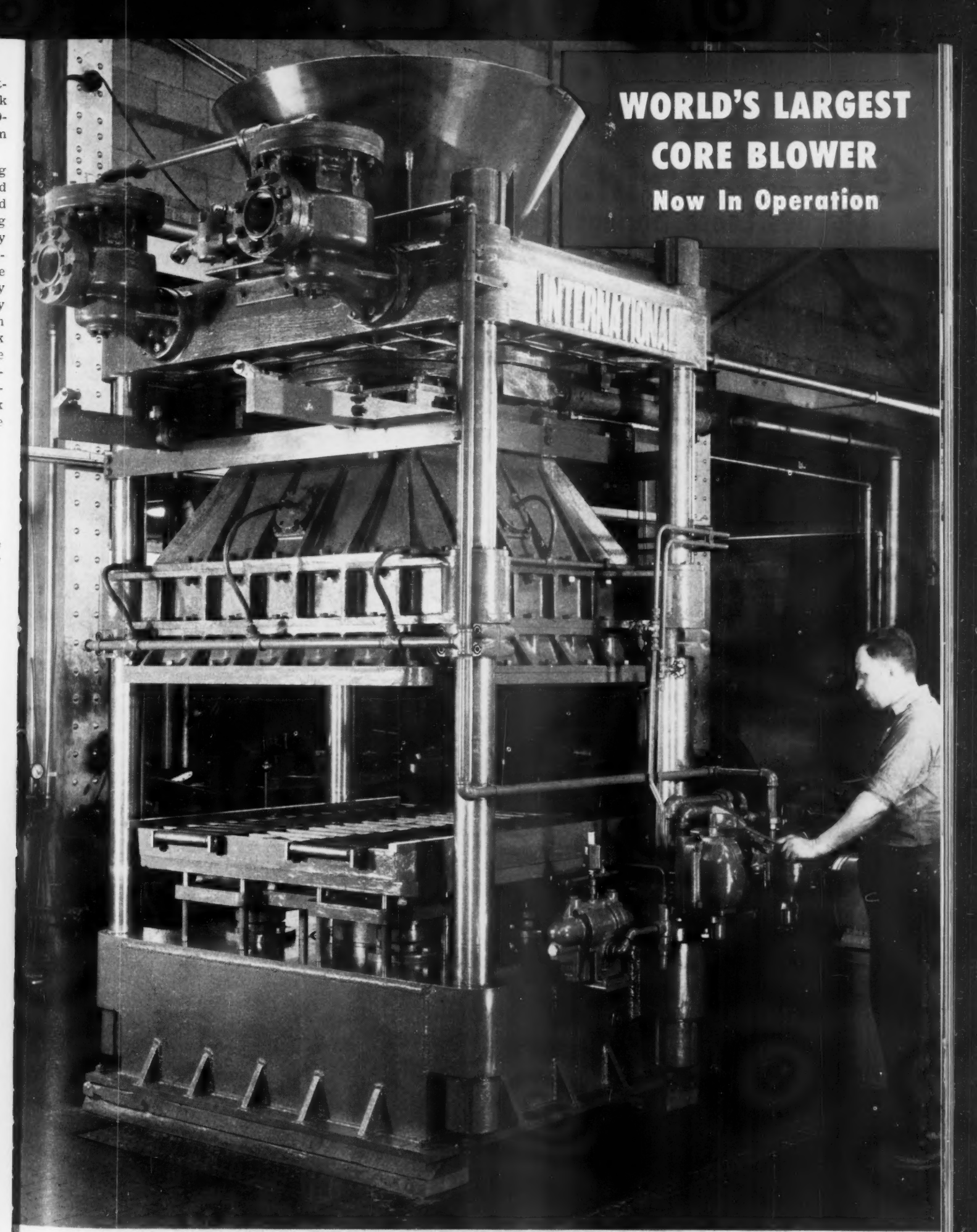
Training programs to create more skilled foundry workers are being sought by United States Labor Department's Bureau of Apprenticeship. The approach will be made locally throughout the country—usually through chapters of the American Foundrymen's Society and local unions. Objective is to obtain in other foundry centers an overall training program comparable to that in the Oakland, Calif., area, where training is said to be on a satisfactory scale.

The country now has 70,000 molders and 30,000 coremakers. Of these, some 35,000 molders and 18,000 coremakers are working at top skill. That allows for machine operators and other workers not regarded as working at top skill. On the other side of the ledger, there are 1160 registered apprentices, and, allowing for an estimated 350 unregistered trainees, a total of around 1510 apprentices.

Inasmuch as molders union officials approve a ratio of one apprentice to eight journeymen, the Bureau of Apprenticeship sees room for improvement in the present apprentice picture.

Firm Honors Old Timers

Kirk & Blum Mfg. Co., Cincinnati, dust control system manufacturer, recently honored 40 employees who have been associated with the firm from 25 to 44 years. Each person received a suitably engraved gold watch. Longest service record is held by a foreman, E. W. Thiery, who joined the firm June 1, 1907, three weeks after it was founded.



MADE BY

INTERNATIONAL MOLDING MACHINE COMPANY

La Grange Park, Illinois

NEW DEVICE

Charges Loose Borings into Cupola

A NEW method of reclaiming cast iron borings in the cupola has been developed by Arthur Croft, Maurice Goff and Douglas Hammond of Crofts(Engineers)Ltd., Bradford, England. The process is being offered for use by industry on a license basis.

As shown in the accompanying illustrations, the method consists of injecting the loose borings into the cupola at a point just above the melting zone, but at a position where the coke, limestone, solid metal and other materials making up the charge will obstruct and prevent ejection of the borings from the stack by the upward flow of gases from the combustion zone.

It is claimed that the borings quickly enter the melting zone where they are rapidly heated to the melting point and merge with the molten metal and slag produced from the solid metal charge, thus reducing to a minimum the period when oxidation of the borings and sulphur absorption may occur. Metal loss with borings is said to be about the same as that encountered normally in melting pig iron and iron and steel scrap, namely around 3 per cent. Amount of borings fed into the cupola may be varied from 5 to 25 per cent of the metal charged.

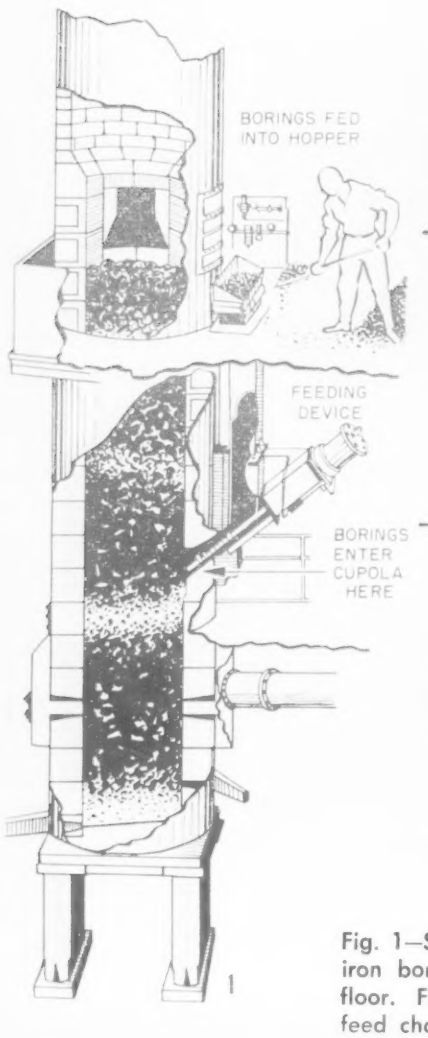
Borings are fed into a chute on the charging platform as shown in the upper right in Fig. 1 and in Fig. 2. Opening of the chute is equipped with a 1¼-in. mesh grid to reject oversize material, and also with a vibrator to prevent packing of the borings. Borings drop down the chute to the feeding device which injects them into the cupola. The feeding device is mounted at an angle of about 45°, and comprises a pneumatically-operated ram. The ram, mounted centrally in the duct, is a steel shaft 2 in. in diam to which a number of shaped lugs are welded at staggered intervals over about 12 in. of its lower end.

At each stroke of the ram through the borings, the lugs push forward a quantity into the cupola. Protective devices prevent the ram from entering the hot zone of the cupola when the duct is empty, or from stopping at the end of its stroke. Control valves permit altering the ramming speed from zero to 30 strokes a minute. At the maximum nearly 2800 lb of borings can be pushed into the cupola.

During a three-month run using the process for injecting borings into a 36-in. ID cupola, a total of 1583 tons (2000 lb) of metal was melted; of this tonnage 26.8 per cent was borings and 62.2 per cent pig iron. With a price differential of around $6.25 per ton between scrap and borings a considerable saving was accomplished.

Another example is a foundry melting 224 tons to produce 132.4 tons of finished castings a week. Before installation of the equipment the charges consisted of 42.5 per cent pig iron, 3 per cent purchased iron scrap, 14.5 per cent steel scrap and 40 per cent home scrap. After putting in the equipment 20 per cent borings were substituted for part of the pig iron and steel scrap and all of the purchased iron scrap. Reduction in pig iron and steel scrap requirements was 18.5 per cent each and 3 per cent in purchased iron scrap. With an approximate differential of $23.75 a ton between borings and pig iron and $6.25 between purchased iron and steel scrap a worthwhile saving was obtained.

At the present time Croft Ltd. is disposing of its coke breeze through the device along with the borings, using around 4 per cent and reducing the coke split accordingly. Granular ferroalloys also may be introduced into the cupola in the same manner.



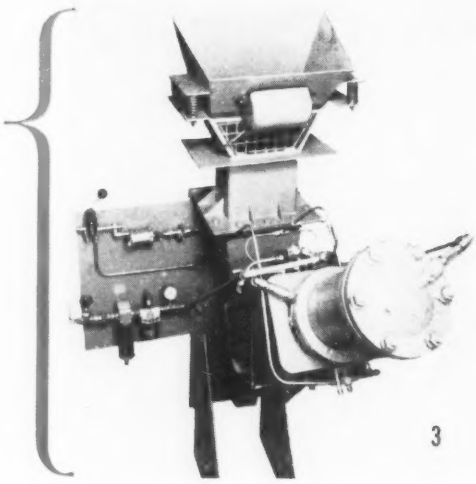
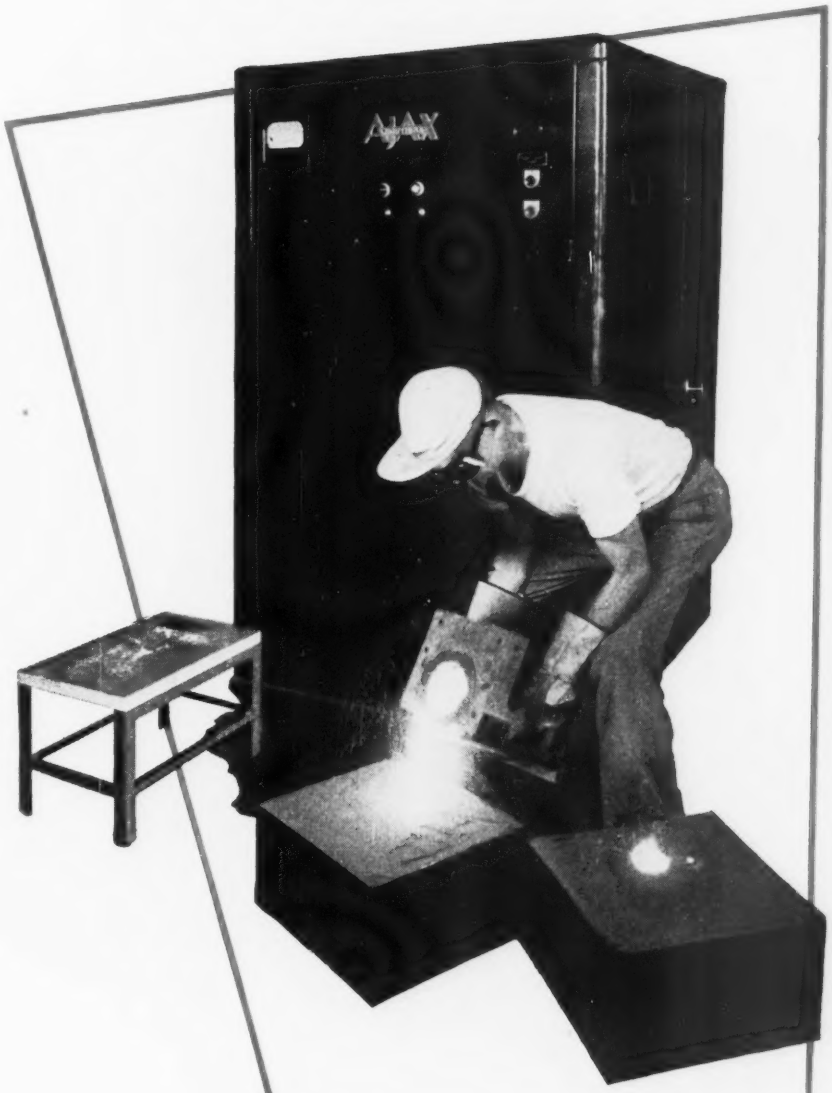


Fig. 1—Sketch of a cupola equipped with feeding device for melting loose cast iron borings. Fig. 2—Showing how borings are fed into hopper at the charging floor. Fig. 3—View of rear end of the feeding device with control panel. The feed chamber can be any length; the short length here is for illustration only

Now The Precision and Speed of Induction Melting

. . . FOR MELTS FROM 3 TO 60 POUNDS
. . . FOR MELTS OF *ANY* METAL



AJAX-NORTHRUP
20K.W. FURNACE

All the speed and accuracy of induction melting in one compact, efficient 20-kw furnace unit. Easy to operate. Automatic stirring. Self-tuning. No moving parts to wear out, maintenance limited to annual inspection of two electrodes. Also available in 3, 6 and 40-kw sizes. Here are a few typical applications:

LABORATORY MELTING:

Complete freedom from contamination. Accurate analysis control. Produces melts in minutes instead of hours. Results can be reproduced exactly in large induction furnaces.

PRECISION CASTINGS:

Speed of melting and accurate control of analysis and temperature make this equipment ideal for small-quantity precision casting. Requires little floor space, fits right into production line.

MELTING GOLD, SILVER, PLATINUM, OTHER PRECIOUS METALS:

Because of low losses, freedom from contamination, and high speed of melting, induction furnaces are used in nearly all mints, assay offices and most refineries.

MELTING NON-FERROUS ALLOYS UP TO 60 POUNDS:

Melts 30 pounds of red brass in 22 minutes from cold start. No contamination. Close control. Switch from one alloy to another by simply changing crucibles.

MELTING FERROUS ALLOYS UP TO 30 POUNDS:

No carbon contamination. Melts 17 pounds of steel in 40 minutes from cold start, 30 pounds in an hour and a half.

Send for free technical bulletin 14-A.

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FOR HEATING AND MELTING

AJAX NORTHRUP

Associate Companies

AJAX ELECTRO METALLURGICAL CORP.
AJAX ELECTRIC FURNACE CORPORATION
AJAX ELECTRIC COMPANY, INC.
AJAX ENGINEERING CORPORATION

AJAX ELECTROTHERMIC CORPORATION

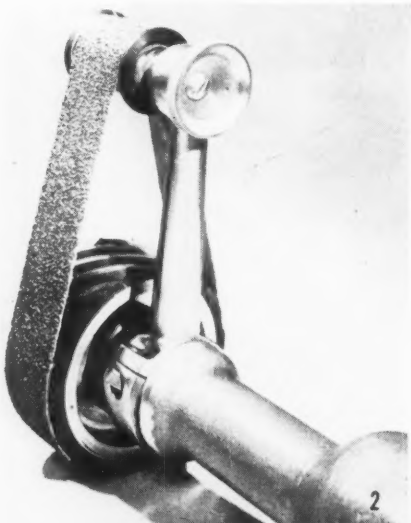
AJAX PARK
TRENTON 5, NEW JERSEY

New EQUIPMENT and Supplies

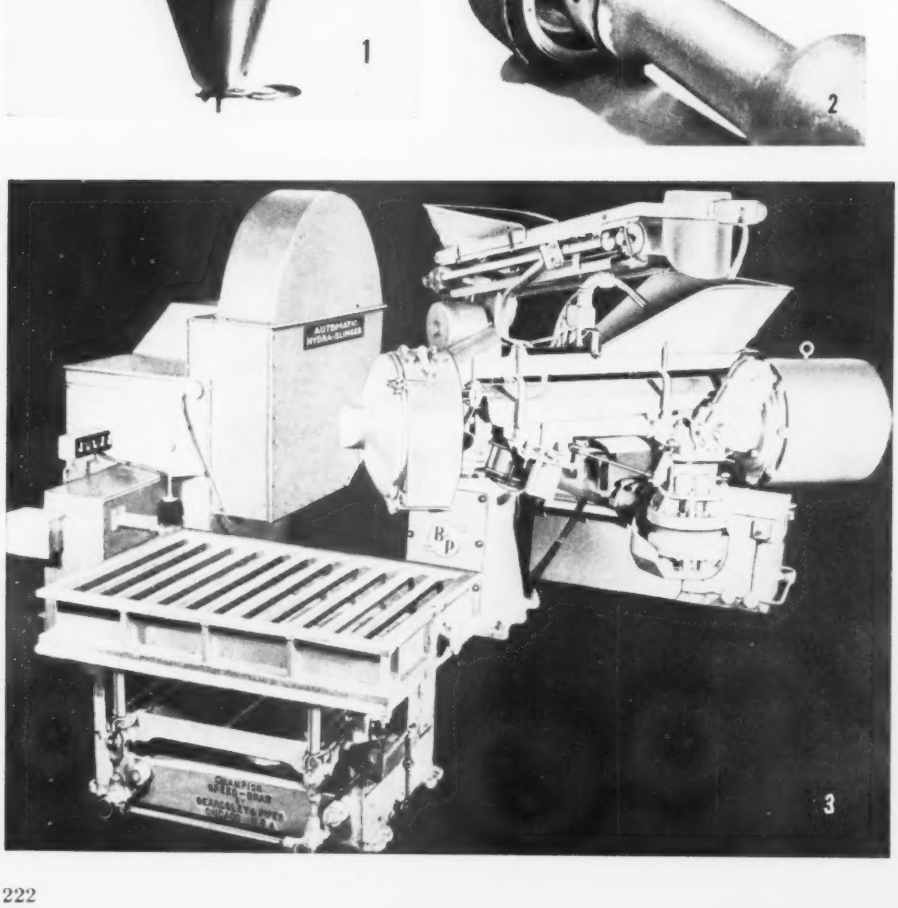
For Additional Information on These Items Use Reply Card—Page 225

(1)—Fire Extinguisher: Red Comet Inc., Littleton, Colo.—Corrosion-proof, rust-proof automatic fire extinguisher consists of a tough, fire-resistant plastic case with cadmium plated metal parts. Carbon tetrachloride, in a sealed glass container so that it cannot evaporate, is contained in the case. When fire breaks out, heat releases a fusible clip which frees a coiled spring built into the lower section of the extinguisher. A plunger shatters the glass container, releasing the fluid. Because the boiling point of pure carbon tetrachloride is 168°F, the fluid quickly vaporizes, enveloping and smothering the fire. A feature of the extinguisher is the detachable top cover which can be taken off so the glass bulb of extinguishing fluid can be removed and thrown manually over the fire. This makes the extinguisher usable as a manual unit if someone is present when the fire breaks out and the automatic feature is not utilized.

For More Details Circle No. 1—Page 225



(2)—Tool Attachment: Carborundum Co., Niagara Falls, N. Y., and Buckeye Tool Corp., Dayton, O. —Attachment which permits use of abrasive belts on straight spindle air



and electric portable tools is made from aluminum castings and consists of an idler pulley, the supporting mechanism, and a contact wheel mounted on the tool spindle. Contact wheel is a small-sized version of the serrated wheel by Carborundum. The attachment is adaptable to almost any portable tool of the proper speed and type. Tests with Buckeye tools using a 2 x 1-in. contact wheel and a 4 x 2-in. wheel, have shown good results. These tools deliver constant spindle speeds of 15,000 and 9000 rpm, respectively. Speeds from 5000 to 10,000 sfpm are recommended for efficient belt usage. Initial belt sizes for these two models are 12 x 1 in. and 20 x 2 in. A wide variety of grit sizes and backings may be used.

For More Details Circle No. 2—Page 225

(3)—Automatic Slinger: Beardsley & Piper Division, Pettibone Mulliken Corp., 2424 North Cicero Ave., Chicago 39—An automatic control station has been added to the company's standard hydraulically operated sandslinger. A set of control cams contained in the automatic control station are marked by directing the ramming unit over the ramming area with the manual control lever. Each point of the desired ramming path is transcribed in ink to the control cams by special marking devices attached to the cam follower arms. The control cams then are removed from the machine and their ink recorded contours cut out. The cams are reset onto the machine and the marking devices replaced by rollers, which follow contours of the control cams as they rotate. The resulting motions are transmitted to the valve mechanism which automatically controls movement of the ramming unit over the mold area, and the machine will repeat automatically the ramming path each time. Ramming cycles up to 90 seconds in duration may be used in automatic operation. Machine also may be operated manually.

For More Details Circle No. 3—Page 225

(4)—Cleaning Unit: Pangborn Corp., Pangborn Blvd., Hagerstown, Md.—New airless blast cleaning barrel features a work conveyor driven by a hardened steel chain and special cast ductile iron slats which will not pinch the work. The conveyor slats turn on the pitch line of the sprockets, and the distance between slats always is the same at any point in travel. An abrasive-tight door and housing have been developed to retain abrasive within the machine and permit economical use of new types of abrasives. During barrel operation, the cleaning and reclaiming system removes sand and debris and maintains efficiency of the abrasive. Good abrasive is deposited in a storage container to be reused. Volume of abrasive flow is controlled by an orifice plate. Drive is by V-belts to a spur gear reducer mounted directly on the work conveyor shaft. An automatic throw-out torque arm which works in both loading and unloading directions disengages barrel drive in case of jams. A push-button control panel is located alongside the cleaning chamber opening. Machine is available in 6 and 12 cu ft capacities.

For More Details Circle No. 4—Page 225

CO_2 Systems: Walter Kidde & Co., 675 Main St., Belleville 9, N. J.—Packaged, automatic carbon dioxide fire extinguishing systems are intended to protect normal industrial types of flammable liquid hazards of up to 6000 cu ft. Each package contains temperature-rate-of-rise fire detectors and connector tubing, automatic control heads, discharge heads, nozzles, and a cylinder supporting frame. Among accessory items available are remote control pull boxes for manually actuating the systems from one or more locations other than at the cylinders, and pressure operated trips that can be installed to close weight-operated doors and windows automatically when the systems discharge. Provision also can be made for shutting down ventilation and machinery by including pressure - operated switches. Alarm gongs and pressure-operated sirens also are available.

For More Details Circle No. 5—Page 225

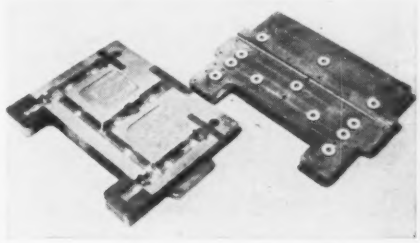
Salt Tablets: General Scientific Equipment Co., 2700 West Huntingdon St., Philadelphia 32—Salt tablet dispenser of 95 per cent glass and plastic, is designed to be strong, simple and foolproof. It holds 750 ten-grain salt tablets. Workers require more salt in the summer months and at any time that their work makes them perspire. Loss of salt in the human body invites fatigue and may even lead to heat prostration. Salt tablets taken to replenish lost body salts help to relieve these effects.

For More Details Circle No. 6—Page 225

Investment: Royaloy Inc., 874 Broadway, New York 3—Water binder investment for use in making molds for small intricate castings produces a hard, smooth surface. It requires no tamping and its setting time can be regulated.

For More Details Circle No. 7—Page 225

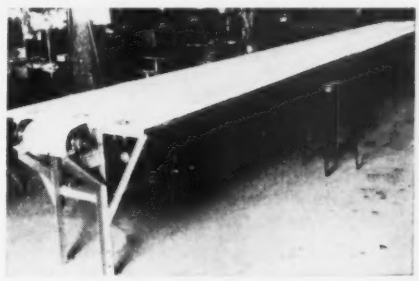
Corebox Inserts: Polymer Corp. of Pennsylvania, 438 Walnut St., Reading, Pa.—Use of nylon bushings at the corebox blow holes, and nylon striker pads at the spots of greatest



wear in the box cavity is said to increase service life of coreboxes. Nylon is reported to be highly resistant to abrasive action of the sand at and around the blow holes and at spots directly below the holes. The plugs and bushings are machined from nylon rod supplied by the company.

For More Details Circle No. 8—Page 225

Table Conveyor: Flexoid Conveyor Co., 1543 East 23rd St., Cleveland 14—Table type belt conveyor has a 12-in. wide belt but can be made to any width or length. Vari-

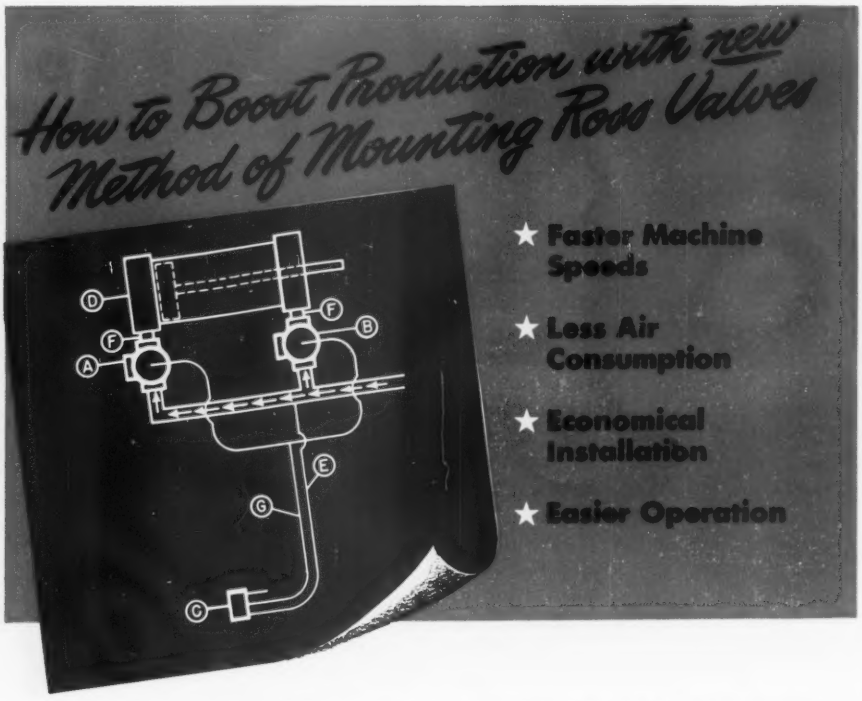


able speed drive runs belt at a normal rate of 20 fpm with a maximum of 40 fpm possible. Belt can be white neoprene, stitched or woven canvas, or rubber, depending on its use. Size of the motor depends on length of the belt and material being handled. A 15-in. table is constructed on each side of the traveling belt, in the work area. Table height is adjustable.

For More Details Circle No. 9—Page 225

Crucible Furnaces: Morrison Industries, 17700 Broadway, Bedford, O.—Top-fired standard size crucible furnaces from No. 50 to 400 are oil

IF IT'S A VALVE FOR FOUNDRY WORK— ROSS HAS IT



Close-coupling of valve to cylinder! That's the story behind the remarkable success of the *new Ross In-Line Master Valve.*

Users claim several important advantages. By placing the master valves (A & B) at the cylinder (D), air supply and exhaust are speeded up appreciably. This in turn permits faster movement of the cylinder piston and materially increases production.

At the same time, the close coupling means that two lengths of large diameter piping between valve and cylinder—pipes continually filled and exhausted with non-productive air—are replaced by two short connecting pipes (F). The resultant saving in air with every movement of the piston considerably reduces operating costs.

Operation is by a small, conveniently located 3-way pilot valve (C). It is supplied through tubing (E) and connected to the master valves by tubing (G). It may be mechanically, manually or electrically controlled. Hand or foot operation is greatly facilitated by the use of the smaller, more easily actuated pilot model.

The complete story of possible advantages in *your* production will be gladly furnished without obligation. Ask for Bulletin No. 302.

ROSS OPERATING VALVE COMPANY

ROSS Air Control VALVES

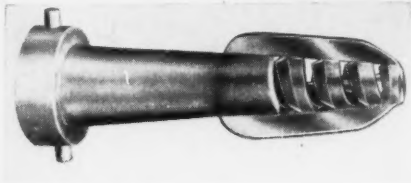
120 E. GOLDEN GATE AVE., DETROIT 3, MICHIGAN

Engineers at Your Service in all Principal Cities

or gas fired and are available in single or twin furnace units. They are made in both stationary and tilting types. They offer combined radiant and convection heating for fast melting. Burners are easy to inspect through holes in the cover, and cannot plug because they are above the cover where slag or metal cannot reach them.

For More Details Circle No. 10—Page 225

Fog Nozzle: Bete Fog Nozzle Inc., Greenfield, Mass.—Giant size fog nozzle, designed to combat large fires indoors or out, delivers a 500 gpm fog blanket with a large diameter



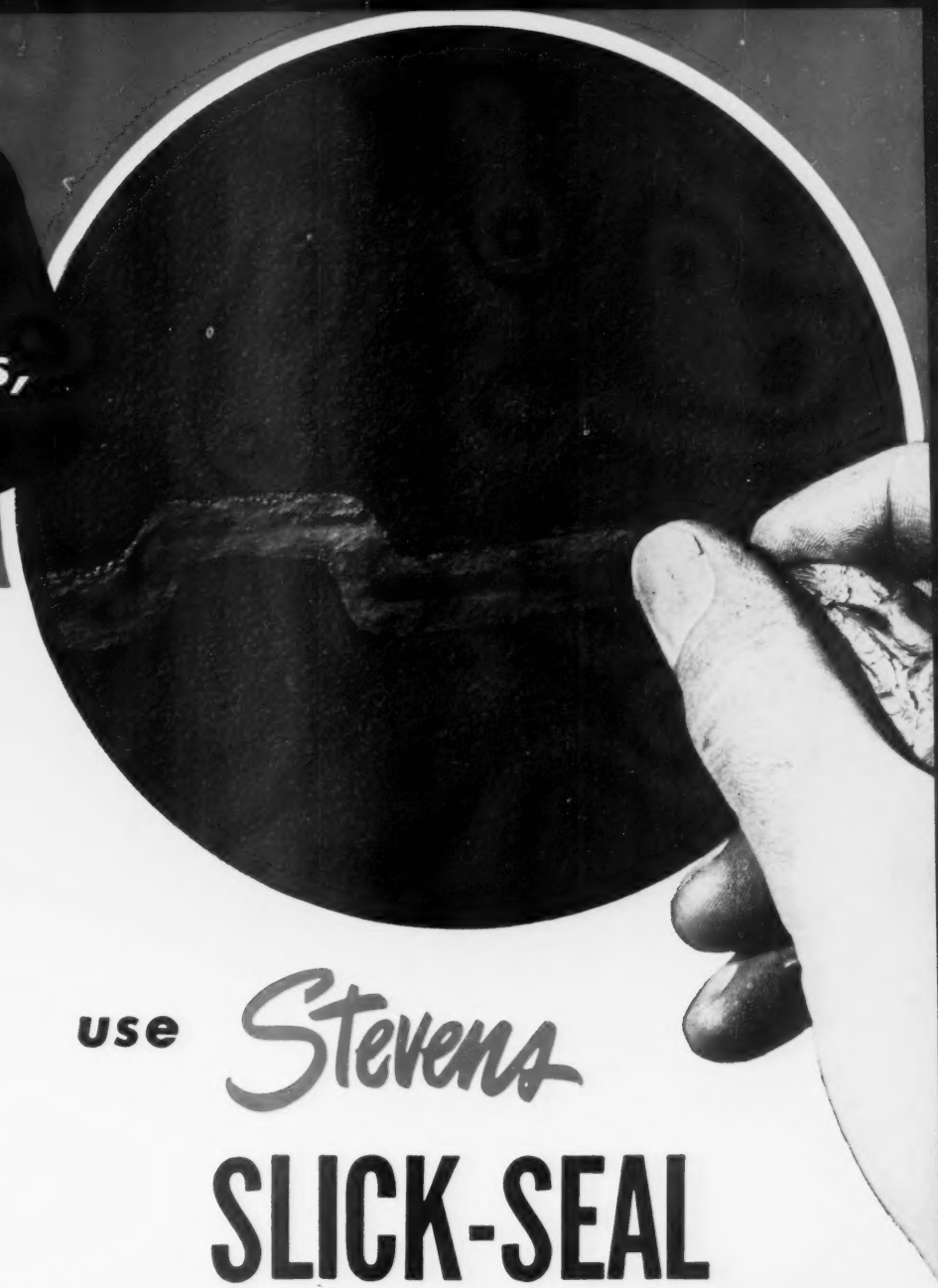
coverage and an effective reach of approximately 80 ft. It is claimed that the cooling effect of this large volume of fog will almost instantly extinguish large flammable liquid fires, as well as wood, paint, and other types of hot fires. Spiral atomizing element of the nozzle contains no small orifices or internal parts. Small stones, bits of hose, washers, or other foreign matter pass through the nozzle without clogging. Nozzle can be attached directly to a hose or turret gun having a 2½-in. National Standard Thread connection.

For More Details Circle No. 11—Page 225

Signal Cell: National Carbon Co., Division of Union Carbide & Carbon Corp., 30 East 42nd St., New York 17—Company's 1000-amp-hr copper oxide signal cell employs a battery element of flat plate construction which consists of two

(*Continued on page* 227)

for improved casting finish *with no burn-ins, flash or fins . . .*



"Performance *plus* what?" you might ask. We hope you do . . . hope you're interested enough to let us demonstrate the many benefits to be derived through your use of Stevens SLICK-SEAL mudding compound.

First, there is the convenience of using a compound that remains plastic and workable during an entire 8-hour shift. Yet, light applications of SLICK-SEAL air-dry in from 1 to 2 hours; heavy applications take only 4 to 5 hours.

Coremakers have a special word to describe its application qualities on pasted joints, core crevices and rough core surfaces. "Slick," that's the word and that's the way SLICK-SEAL goes on, smooth and easy with no crumbing, rolling or balling up behind thumb or finger. It leaves the hands clean . . . a most important advantage to women core workers.

Feather edges do not shrink or curl when subjected to oven or metal heat. Flowing metal can't dislodge SLICK-SEAL, cause it to flake, peel or spall off. SLICK-SEAL positively prevents fins or burn-in at pasted joints, because the compound itself is an excellent, high heat resistant facing. Covered by a core wash or not . . . *it improves metal finish.*

ORDER SLICK-SEAL TODAY
. . . at our risk!
If you do not find it to be superior to the compound you're now using, return any unused portion for complete credit or your money back. *You must be satisfied!*

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SLICK-SEAL MUDDING COMPOUND

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"EVERYTHING FOR A FOUNDRY"
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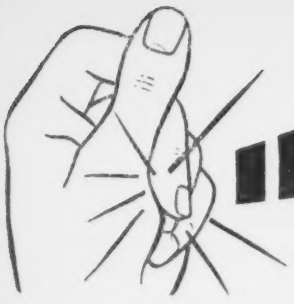

IDEAS FOR FOUNDRYMEN

AVAILABLE FOR THE ASKING—This reader-service is designed to provide foundrymen with "idea" and reference material. Listings are selected from company product literature and reprints of special FOUNDRY editorial articles.

50. Nonferrous Specifications

Western Metal Co.—"Specifications Non-Ferrous Ingot Metal Alloys" is title of 40-page booklet which contains tabulated ASTM, Navy, Federal and SAE miscellaneous specifications for brass and bronze ingots and castings, as well as for aluminum base alloys.

51. Bucket Loader

National Engineering Co.—How a compact bucket loader can speed foundry sand handling and utilize full production capacity of Simpson Mix-Mullers is described and illustrated in 4-page bulletin 485A. Design specs, space requirements and other dope are included.

52. Foundry Conveyors

Logan Co.—Here's a catalog especially tailored for foundry executives. There are over 60 pages of facts and figures on complete conveyors systems as well as on conveyor roll constructions, size and capacities. Power as well as gravity conveyors are discussed. You'll profit by getting catalog No. 16.

53. Sprue Cutters

Rice Pump & Machine Co.—Spruce up your castings with a sprue cutter, three models of which are described in 4-page folder along with outlined construction features and advantages. Machines clip off sprues and gates on nonferrous castings in one sure stroke of cutting knives.

54. Flow Control Valve

Hauck Mfg. Co. — Guess what! "Guesstimating" in the regulation of oil flow to any type burner is eliminated by the Micro-Cam flow control valve, according to 4-page catalog No. 704A. Folder summarizes features, tabulates valve capacities and presents dimensional drawings.

55. Blast Cleaning Barrels

Pangborn Corp.—Detailed cutaway illustrations and line drawings in 28-page bulletin 213A show operation of airless Rotoblast tumbling barrels and such component assemblies as the drum and conveyor sections, barrel section, abrasive handling and reconditioning system, and reversing drive mechanism. Spiral conveyors, bucket elevator Rotoblast tables and special machines are covered.

56. Dirty Ladles?

Cleveland Flux Co.—To get at the "flux" of the matter in cases of dirty ladles, you will need Cornell ladle flux as described in 4-page bulletin 48-L. Supplementing this bulletin is an instruction sheet for using this chemical flux as well as iron cupola flux. Send for it and give the ladle of the house a break.

57. Gray Iron Castings

International Nickel Co.—Do you want dense sound gray iron castings with better machinability and uniform properties? Then read all about Nisiloy, the nickel-silicon alloy that is metallurgically designed to give these results. It's fully described in 8-page brochure "Nisiloy for Gray Iron Castings."

58. Refining Cupola Iron

Mathieson Chemical Corp.—All the facts and figures necessary to refine and desulphurize cupola iron with Purite are given in 8-page illustrated guide AD-321. Exactly how to use this fused soda ash is explained.

59. Electric Truck Power Units

Ready-Power Co.—Types of gasoline-electric and diesel-electric power for electric industrial trucks made by this company are described and many, many applications shown in 8-page revised bulletin 99.

60. Cupola Gun Mix

Eugene W. Smith—A gun mix that works! That's what brief 4-page folder says of Sil-Gan cupola gun mix. When sharp angular particles of the mix hit the wall of the melting zone, they penetrate and stick. Get the point?

61. Pipe Fitting Maker

Cleveland Tapping Machine Co.—6-page illustrated bulletin F-100 is descriptive of the new series F fittings machine which taps holes in all shapes of ½ to 2-in. size brass, malleable and cast iron pipe fittings.

Additional Information?

For additional information on any of the items described under "New Equipment and Supplies," "Trade Publications" or "Ideas for Foundrymen" in this issue—simply circle corresponding item numbers on one of these cards

7-52

FOUNDRY
Penton Building, Cleveland 13, Ohio

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9	21	33	45	57	69	81	93	105	117
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62. Rough Grinding

Norton Co.—You may have rough sledding with your rough grinding operations unless you send for 54-page illustrated pocket-size booklet entitled "Rough Grinding." It describes line of abrasives and bonds, grinding wheels and disks, mounted wheels and points, core files, rubbing blocks and wheel dressers.

63. Keeping Cutters Cutting

Carborundum Co. has compiled a really practical guide book for the users of cutting tools. It's entitled "Maintenance of Alloy and High Speed Cutting Tools," and you can get a copy by asking for booklet No. 10. This 72-page handbook shows and explains just how to keep tools in tip-top condition.

64. Blowers-Fans-Exhausters

General Blower Co.—"Lungs for Industry" does not cover human breathing apparatus, but is title of 16-page illustrated catalog on blowers, fans and exhausters for blowing, heating, cooling, conveying, aerating, separating and agitating. On second thought, it is breathing apparatus—for your plant.

65. Foundry Equipment

Accurate Match Plate Co. — Aluminum pressure-cast products for the foundry, including match, cope and drag plates; pattern castings; core, dump, split and booked boxes; patterns and molds are described, illustrated and priced in 16-page catalog.

66. How Hot?

Illinois Testing Laboratories, Inc. —Whether the temperature is 0 or 3000° F, there's a proper size and type of portable or Pyro Lance pyrometer that will show you exactly how hot a furnace, oven or molten metal is. Bulletin 1724-D tells you all about them.

67. Sand Conditioning

Beardsley & Piper Div., Pettibone Mulliken Corp.—If there's anything you want to know about sand mulling or mulling equipment, you'll find the information in three 36, 8 and 4-page illustrated bulletins 1220, 1615 and 1315A. They deal with Speedmullors, portable Mulbaros and Screenarators for Mulbaros, respectively.

68. Industrial Showers

Logan Emergency Showers, Inc.—Photos showing various types of showers, along with their descriptions, are included in 6-page form 30. Comparative effectiveness of each of three types, plus piping layouts, are covered. Don't let employees carry your dirt home.

69. How About Ductile Iron?

Fourteen reprints from leading engineering publications are described briefly in 4-page bulletin "Available Publications on Ductile Iron." All of these technical papers are offered free by International Nickel Co. There's a coupon so that you can get those you want. There's also space to present some specific problem you have on use of ductile iron. Company will aid you in solving problem.

70. Electric Equipment

Electric Equipment Co.—16-pages of ac and dc motors, generators, m-g sets, transformers, switches, control equipment, capacitors, compressor, platers, etc. are covered in list M 101. And the pages are jam-packed full. You can find it here.

71. Core Blowers

Federal Foundry Supply Co.—Don't blow your top over the core blowers you're using. Send for 18-page illustrated brochure CB-3 which describes line of San-Blo core blowers, the only blowers with motor-driven plows and 'aerating' air circuits. You also get 4-page folder and data sheet CB6 on blowers with pulsators.

72. Pulleys With Pull

Stearns Magnetic, Inc.—Features, descriptive data, line drawings and tabulated specifications and dimensions are offered in 8-page illustrated bulletin 350C on Alnico Permanent magnetic nonelectric pulleys for removing tramp iron and other metallic refuse from bulk materials.

IMPORTANT READING FOR FOUNDRYMEN

We have a limited quantity of the following reprints which we can furnish while they last.

73. Foundry Pyrometry

Pouring temperature has important effect on properties of nonferrous metal castings. Two articles by R. A. Colton describing various influences of temperature control plus types of pyrometers and how to use them effectively are now available in single FOUNDRY reprint entitled "Pyrometry in the Nonferrous Foundry."

74. Foundry Modernization

"Modernization without Mechanization" is title of 8-page illustrated FOUNDRY reprint of article by L. B. Knight which points out how various malleable and grey iron foundry operations can be modernized without complete mechanization.

75. Anthracite For Fuel

Interest in use of anthracite as a cupola fuel has increased with tightening in supplies of coke. Dr. C. C. Wright of Pennsylvania State College Div. of Fuel Technology offers recommendations to foundries contemplating use of anthracite with their usual cupola fuel in FOUNDRY reprint "Selection and Use of Anthracite for Cupola Fuel."

76. Plastic Core Driers

American Cyanamid Co.'s plastic material called Laminac resin, a Fiberglas reinforced plastic practical for fabricating driers used to support cores of complicated shape on their travel through the oven, is subject of 2-page illustrated FOUNDRY reprint "Reinforced Plastic Core Driers Developed for Electronic Baking."

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RIGHT for YOU

because we use the RIGHT COAL to make New England FOUNDRY COKE

Continuous research is necessary to meet the changing requirements of modern industry.

Our new coal research laboratory

is typical of the modern facilities and resources now available to us to help produce a high quality New England Foundry Coke which will satisfy your exacting demands.

NEW ENGLAND COKE

NEW ENGLAND COKE COMPANY

Subsidiary of

Eastern Gas & Fuel Associates

250 Stuart St., Boston 16, Mass.

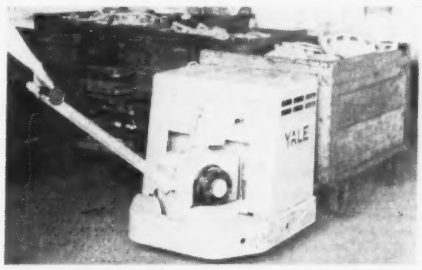
HUbbard 2-8400

(*Continued from page* 224)

molded copper oxide plates and three zinc plates, assembled in a standard AAR glass jar with porcelain cover. Special features of the cell include a safety step insulator which prevents internal drains between electrodes by foreign material bridging the insulators, and two inverted U-shaped indicator sections at the bottom of each outer zinc plate to give better visual indication of approaching exhaustion.

For More Details Circle No. 12—Page 225

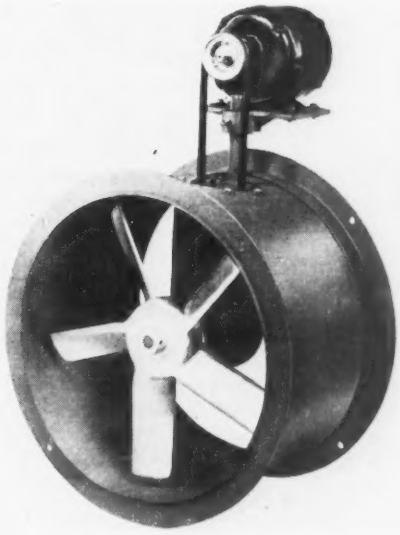
Platform Truck: Yale & Towne Mfg. Co., Philadelphia Division, 11000 Roosevelt Blvd., Philadelphia 15—Low-lift platform, powered hand



truck for horizontal transportation of skids and bins has 7500-lb capacity. It has an 11-in.-high platform with 3 in. of lift. For operation on ramps, it has 5 in. underclearance. The platform is 26½-in. wide. Standard platform length is 42 in., but other lengths are available.

For More Details Circle No. 13—Page 225

Fan: Standard Electric Mfg. Co., West Berlin, N. J.—General purpose fan is designed for exhausting dangerous or obnoxious fumes, dirt, heat and smoke, and for other applications where it is desirable to have the motor outside the air stream. Explosion-proof, enclosed, or open type motors are available in ¼ to 7½ hp. The unit meets UL

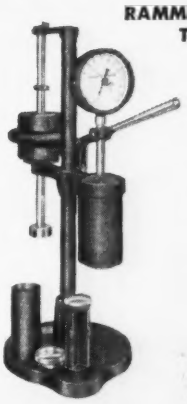


THE Short Cut TO LOW Scrap Losses

When consideration is given to the number of casting defects directly traceable to faulty sand practice, it becomes apparent that proper sand control is the short cut to low scrap losses.

The Gordon-Campbell sand testing units offer the latest improvements for checking these critical properties of sand mixtures: clay content, permeability, bond strength, moisture, core hardness, and core strength. The tests are quick, and no calculations are required. They offer the simplest approach to sand control.

Write for full particulars on Gordon-Campbell sand control units. Savings in scrap losses will pay for the program.



RAMMER-COMPRESSION TESTER—This simple unit combines ramming of specimens for permeability tests and making bond strength tests. Strength values are read on large dial.

PERMTESTER Permeability values for molding and core sand mixtures are shown on dial in a few minutes.

All Gordon-Campbell sand testing units are designed to conform with the recommendations of the Committee on Foundry Sand Research of the American Foundrymen's Society.

FREE TO ANY FOUNDRY MAN

Write for this booklet. It explains foundry sand control and how to reduce scrap losses.

GORDON SERVICE

CLAUD S. GORDON CO.

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Metallurgical Testing Machines • Industrial Furnaces & Ovens • Temperature Control Instruments • Thermocouples & Accessories

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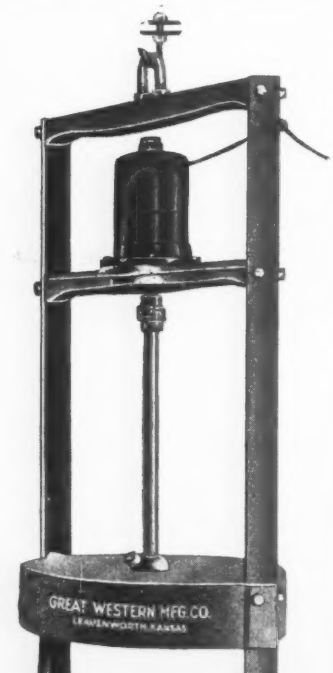
COMBS FOUNDRY RIDDLES

Cut Your Screening Costs 90%... Step Up Production Speed 2000%

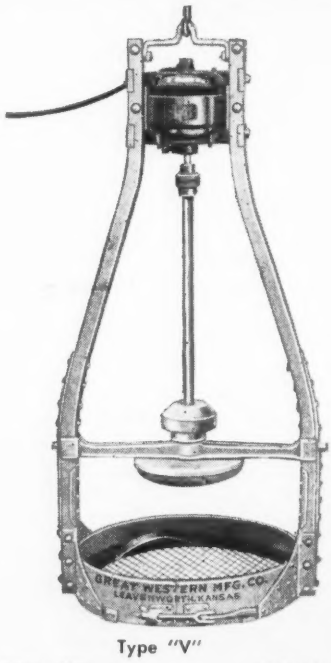
WORLD FAMOUS!

Type "HL" Lab Sifter for sand control $202.00 without sieves

Type "CS" with 24" square screen and automatic discharge $320.00



Type "CR" with 24" sieve $310.00



Type "V"
With 20" sieve $250.00
Also made with 36" sieve $450.00

All these machines cost less than 1c an hour for power. Quickly removable steel rim sieves can be removed, emptied and replaced in seconds. Saves up to 97% of your labor costs. Send for free descriptive folder.

Prompt Delivery From Your Foundry Supply House

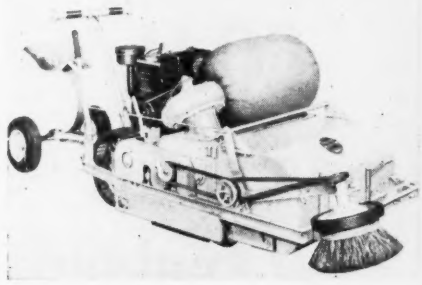
GREAT WESTERN MFG. CO.

Leavenworth — Kansas

specifications for spray booths. Features include sealed bearings in replaceable flange construction, double angle motor support to minimize vibration, adjustable motor base for belt take-up, and heavy cast aluminum fan blade in sizes from 18 to 42 in.

For More Details Circle No. 14—Page 225

Sweeper: Motor-Mower Co., Moto-Sweeper Division, 4600 Woodward Ave., Detroit 1—Sweeper has dual



brushes arranged in tandem, and vacuum dust control, providing triple action sweeping. The dual brushes operate in opposite directions—the front brush, moving in a clockwise direction, throws the heavier debris upward in the path of the rear brush, which, operating in a counter-clockwise direction, deposits it in the hopper, allowing none of the refuse to be thrown forward and underneath. The dust in turn is drawn upward and pocketed by a vacuum system. Power steering provides maneuverability and is accomplished by use of a separate clutch on each wheel operated by levers on the handle bar. Optional equipment includes a sulky for riding behind the sweeper and a side brush for cleaning along walls as shown in the illustration.

For More Details Circle No. 15—Page 225

Sanding Cloth: Bay State Abrasive Products Co., Westboro, Mass.—Sanding fabric has the abrasive imbedded in a tough, open-mesh fabric

that holds the abrasive firmly, but lets the removed stock flow through the holes. Consequently, the abrasive does not become clogged with removed material and effective life

(*Continued on page* 230)

AIRCO MACHINE GAS CUTTING

...speeds riser removal
...minimizes grinding
...increases accuracy
...reduces operator fatigue

Cutting risers with an Airco gas cutting machine saves time, greatly decreases grinding and/or machining—and by reducing operator fatigue, it increases and speeds-up production.

Here, for example, is illustrated a simple machine set-up that permits fast, accurate riser cutting. Using an Airco Radiagraph, the casting — measuring 105″ in diameter and 5″ in thickness — is trimmed at a speed of 5″ per minute. More important, the Radiagraph cuts so close to final machining specifications that slow expensive machine work or grinding is eliminated, and a costly production bottleneck is done away with.

This actual case history demonstrates the advantages of removing gates and risers by machine gas cutting. Airco gas cutting machines are easily adaptable to any cutting requirements — straight line, circle, or bevel-edge cuts.

If you would like further details on how machine gas cutting, as well as other Airco oxyacetylene processes can save time and money for your foundry operation, call or write your nearest Airco office — today.

Top photograph shows the simple set-up that makes easy work of a tough job. Above you see the clean, accurate cut, ready for machining.

AIRCO

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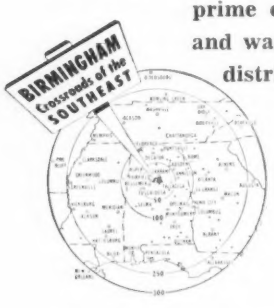
Now the South's "Trucking Capital"

SCHEDULED DELIVERY TIME IN DAYS TO PRINCIPAL CITIES REACHED BY FAST MOTOR FREIGHT OUT OF BIRMINGHAM TL and LTL
3 DAYS
2 DAYS
1 DAY
BIRMINGHAM

"No. 1 Gateway" to Alabama and the South is the designation given Birmingham by trucking associations. Through this natural Gateway, 68 truck lines—42 of which have headquarters here—give direct, fast scheduled service to the Nation's markets. They provide regular daily or overnight truckload and less-than-truckload service and also make direct deliveries to principal cities in the South, East and Midwest. Their equipment comprises every type required for general commodity and specialized operations.

Out of Birmingham to major market centers, Birmingham's truck lines transport a large tonnage of this district's finished products—textiles, iron and steel articles, chemicals, food products, marble, and many more. Into large storage warehouses in this geographic center of the South, they bring from many sections of the country a wide variety of products for distribution throughout Southern markets.

Birmingham's extensive motor carrier facilities have been a prime consideration with many of the industries and warehouses that have located recently in this district.



For specific rate information or other data on trucking service into or out of Birmingham, write this Committee.

BIRMINGHAM COMMITTEE OF 100

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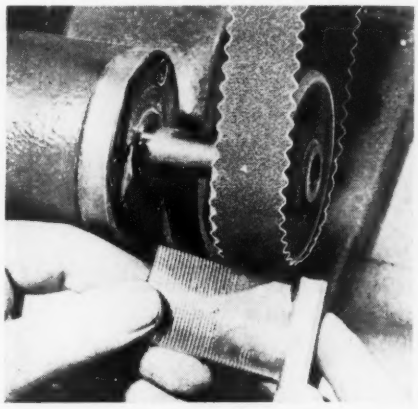
Tennessee Coal & Iron Div.
United States Steel Co.

(Continued from page 228)

of the sanding fabric is lengthened. It is available in all the finer grits suitable for smoothing surfaces on either wood or metal. Either side of the sanding cloth may be used wet or dry, flat or folded, on sanding machines or by hand, and it may be cleaned by rinsing in water.

For More Details Circle No. 16—Page 225

Grinding Belt: Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul 6—Serrated-edge grinding belt



is designed for precision grinding and finishing of small radius and filleted parts. In use, the scallops of the belt curve around the edges of the contact wheel, allowing fillet areas to be polished on the edge contour of the wheel. The belt may be used on crowned, contoured, or rounded-edge wheels, or with shaped back-up supports, and can be used by machine or by hand. It is available in all standard abrasive belt constructions.

For More Details Circle No. 17—Page 225

Air Flow Valve: Mine Safety Appliances Co., Braddock, Thomas, and Meade Sts., Pittsburgh 8—Continuous air flow control valve regulates air flow from a compressed air source to an operator using respiratory protective air line equipment. It also acts as a secondary air filter. A cartridge container, replaceable cartridge, and the air flow check valve comprise the control valve assembly. A position action adjustment knob on the cartridge container regulates the amount of air flowing to the operator. Easy to set, the knob cannot be changed accidentially. Air flow cannot be cut to less than 2 cfm.

For More Details Circle No. 18—Page 225

Cab Cooler: Dravo Corp., Air Conditioning & Combustion Dept., Dravo Bldg., Pittsburgh 22—New split type, 3-hp crane cab cooler is designed to maintain a temperature of 80 to 85°F within a crane cab when the surrounding ambient temperatures reach 130°F. Unit, which

supplies continuous ventilation, is equipped with electric strip heaters for winter heating, dust and dirt filters and activated carbon canisters for fume and odor removal. Operation and control for summer and winter temperatures is automatic. The evaporator section can be installed within the cab, while the condenser section may be located in any convenient place on the crane. The two sections are connected by refrigerant piping.

For More Details Circle No. 19—Page 225

Face Shield: United States Safety Service Co., 1215 McGee St., Kansas City 6, Mo.—Light-weight face shield is said to be comfortable to wear. It features an all-green plastic spark protector, which affords wide angle vision and still eliminates glare from overhead lighting. The visor can be locked in the up position or the working position. The shield is available in three styles of headgear with clear or green visors, and a special acid-resistant visor for use around acid and chemicals.

For More Details Circle No. 20—Page 225

Lead Letters: H. W. Knight & Son Inc., Seneca Falls, N. Y.—Extra-thick lead letters and figures designed for industrial x-ray use are said to withstand long exposure and heavy rays without fading. They feature a modern, legible design. They are ¼-in. thick and come in three sizes: ½, ¾, and 1-in.

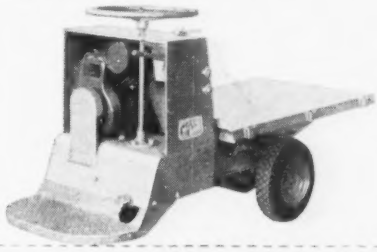
For More Details Circle No. 21—Page 225

Separator—Trap: Strong, Carlisle & Hammond Co. 1392 West Third St., Cleveland 13—Combined unit for removing water, oil and

scale from compressed air and trapping discharge liquids collected by the separating unit, is designed for installation in air lines just before

WITH KWIK-MIX Moto-Bug®
POWER WHEELBARROW

- This low-cost power wheelbarrow takes *all* the high costs and hard work out of material handling . . . hauls 10 cu. ft. (struck) of bulk materials, or 1500 pounds, in big-capacity hopper.
- Moto-Bug has full power forward *and reverse* . . . no push, no pull necessary for traveling, backing up, or spotting. Reverse is *instantaneous* . . . no need to swivel steering wheels for reverse-direction travel.
- Climbs 20% ramps or grades fully loaded . . . there's plenty of traction because 75% of loaded weight is on front drive tires. Dual drive tires are optional . . . rear dual steering wheels are standard equipment.
- Operator rides on rear step . . . large steering wheel, with 3.6-to-1 gear ratio, provides effortless steering and maneuvering. Moto-Bug turns in its own length . . . 33" width clears narrow aisles, doorways.
- Other Moto-Bug advantages: Instant gravity dump, with snub-line control . . . and 5-ft. scraper blade, which attaches to Moto-Bug without need for removing hopper.
- Interchangeable units: 1500-lb. flat-bed (below) . . . 500-lb. fork lift with manual pump, or 1000-lb. fork lift with power-driven hydraulic pump. Get more Moto-Bug facts from Kwik-Mix distributor, or write us.



Send for complete Moto-Bug facts to: **KWIK-MIX CO., Port Washington, Wis.**

NAME ..... TITLE .....
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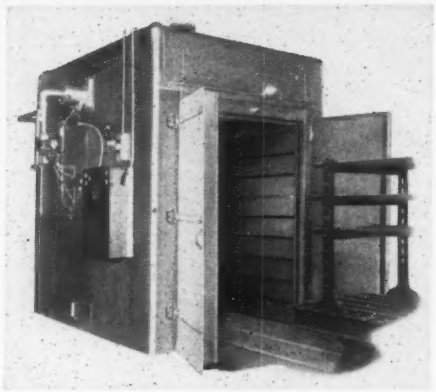
STREET .....
CITY ..... STATE .....

KM255FO

KWIK-MIX COMPANY
PORT WASHINGTON, WIS.
Koehring Subsidiary

LET OUR *Specialists* HELP YOU WITH YOUR OVEN PROBLEMS

IT COSTS
NO MORE
AND YOU CAN BE
SURE OF RESULTS



PUT our engineers to work on your core-baking problems. Their 150 years of combined oven engineering experience is your assurance that the oven they design for you will exactly meet your needs. Tell us your requirements and we shall be pleased to give you our recommendation. No obligation.

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Principal Industrial Areas

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419 Brainard St. Detroit 1, Mich.

DIAMOND BLAST SAND

FLINT It PAYS to U SHOT

SYMBOLS OF DEPENDABILITY

FLINT SHOT — the recognized standard of mineral abrasives for sandblasting.

Composed of natural, hard flint grains, FLINT SHOT is economical for it may be used over and over again. Due to its uniformity, FLINT SHOT is more efficient because it cleans faster.

Available in bulk or bags

FLINT MOLDING SILICA

POWDERED SILICA SIL-CO-SIL

99% PURE SILICA

SILURIAN SAND

LaSalle Crude

ETERNAL AS THE SANDS OF TIME

OTTAWA SILICA CO.

Ottawa Silica Co.

Plants located at OTTAWA, ILL. ROCKWOOD, MICH.

the air-using machine. Unit also will perform the same function in steam lines. Two models are available—one for ½ and ¾-in. pipe and the other for 1, 1¼, and 1½-in. pipe.

For More Details Circle No. 22—Page 225

Roof Repair: Paramount Industrial Products Co., University Center Station, Cleveland 6—Liquid roof treatment and a plastic cement for stopping roof leaks are applicable even on wet roofs. The roof treatment is made of asphalt and asbestos plus special penetrating oils which cut through surface moisture and stop leaks. It is applied with a brush and is ready for use without mixing or heating. The plastic roof cement is for use in patching holes, cracks and blisters and repairing falshings, firewalls and gutters in damp or rainy weather. Of paste consistency, it is applied with a trowel.

For More Details Circle No. 23—Page 225

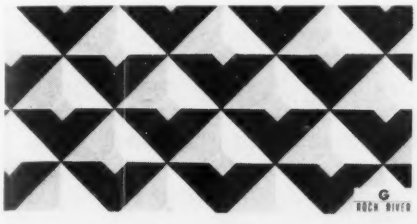
Transporter: Wall Mfg. Co., P.O. Box 5006, Winston-Salem, N. C. —Bulk material delivery equipment is a complete unit, consisting of truck body with belt conveyor in the bed and detachable outside conveyors. Body capacities range from 120 to 380 cu yd, and conveyors are built in optional lengths, 8 through 16 ft. They are equipped with belts of 28-oz duck with neoprene top and bottom covers. Unit is powered by the truck motor by direct shaft drive through transmissions. The rear transmission, which drives the tandem conveyor, allows operation within a 180-degree arc from the rear of the truck at an elevated or depressed angle. Conveyor in bottom of the truck bed is covered by removable plate sections which prevent the belt from

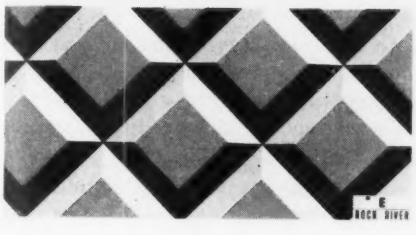
carrying the load during transportation. When material is to be discharged, the tandem conveyor is set in place at rear of truck. Both belts are put in operation by engaging

their transmissions. Then the protective plates in the bottom of truck body are removed, one by one to allow the conveyor belts to unload the material into bin or car.

For More Details Circle No. 24—Page 225

Patterns: Rock River Lumber Co., Prophetstown, Ill. — Standard wood patterns are used for producing





foot treads, strip-plates, thresholds, or any place where a tractable or safety surface is desired. Patterns are made in seven standard diamond and square designs—size 12 in. by 8 ft.

For More Details Circle No. 25—Page 225

Repair Kit: Gas Arc Supply, 223 North Sixteenth St., Philadelphia 2—Kit for on-the-job repair of cutting and welding hose contains necessary tools and replacement parts for putting a new nipple-ferrule-nut assembly on the end of a length of hose, permanently splicing two lengths of hose, and temporarily coupling two sections of hose. The finished work is said to be equal to that found on the original equipment. Kit consists of heavy gage, tinned steel, compartmented box, 5¾ x 11½ x 1¾-in., repair parts for ¼ or 3/16-in. oxygen or acetylene hose, including nipples, nuts, and ferrules; double-ended splicing nipples, and threaded coupling sections. All nuts, nipples and couplers are solid brass, and ferrules are either brass or aluminum. Also included are two hose ferrule crimping tools, one for each size hose.

For More Details Circle No. 26—Page 225

Goggle: Willson Products Inc., Reading, Pa. — All-plastic safety goggle features a flexible, fully transparent frame. One-piece lens is of 0.060-in. acetate and is separately replaceable. Goggle fits over all types of prescription glasses.

For More Details Circle No. 27—Page 225

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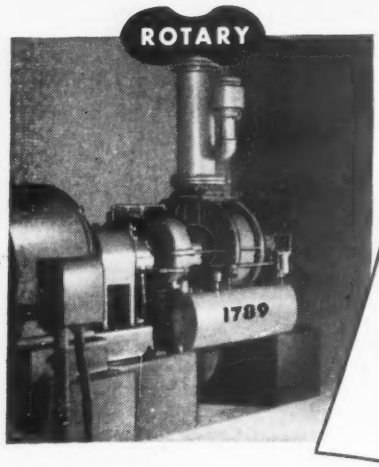

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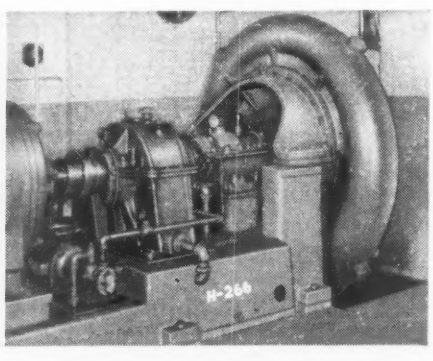

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Effect of Blacking Addition

(*Continued from page* 111)

and hot strengths of this sand, it was found that the number of core rods could be reduced. This was reflected, of course, in the reduced cost of making the cores and their removal in the cleaning room.

Accompanying illustrations show various rough, semifinished and finished castings as well as some of the cores. Fig. 1 shows some piston and head cores ready for the foundry. Fig. 2 shows the complicated core work involved in a cylinder head sectionalized in the rough. Fig. 3 shows an interior view of a piston casting. A liner casting is shown in Fig. 4. The rough surfaces below the water jacket will be subsequently machined to remove compression stresses set up within the castings during solidification and cooling to atmospheric temperature. Fig. 5 is a water cooler line core in the process of assembling.

The next application of blacking was in molding sand for heavy flywheel castings. The sand mixtures for these parts included: System sand 60.4; Portage sand (40-60)—21.7; fire clay 3.62; western bentonite 2.34; blacking 9.0; Easy Clean compound 1.7; and wood flour 1.08 per cent.

TABLE III—CONFINED EXPANSION OF SANDS

(Inches per inch)

	Blacking Core Sand		Blacking Dry Sand Facing	
	1500°F	2500°F	1500°F	2500°F
1 min.	.0035	.011	.00225	.0095
2 min.	.0065	.015	.00475	.01175
3 min.	.0125	.0155	.00825	.0110
4 min.	.015	.0145	.01025	.01075
5 min.	.0155	.0165	.01225	.01025
6 min.	.0165	.0195	.01275	.0100
7 min.	.0175	.023	.01175	.0110
8 min.	.0185	.025	.0115	.0115
9 min.	.0190	.026	.01125	.0120
10 min.	.0190	.0275	.01075	.0125
11 min.	.0190	.0285	.01025	.0125
12 min.	.0190	.0295	.00975	.0125

This mixture must be mulled dry thoroughly before being brought to its temper point. Its physical properties include: Green permeability 11 to 15; dry permeability 25-30; green compression 12-14; dry compression 250-350; baked shear 73-75; tensile strength 180-195; moisture 7-8; flowability 65-67; density 100-102. Hot strength after 12 minutes: 500° F—390 lb; 1000° F—270 lb; 1500° F—690 lb; 2000° F—930 lb; 2500° F—170 lb. Shock test at 2500° F showed no cracks.

The molds of this sand are baked at 625° F.

The confined expansion of the blacking core and molding sands is given in Table III in inches per inch and is approximately 47 per cent of the regular core and molding sands

formerly used for these castings. Fig. 6 shows the graphs of these sands.

In conclusion it should be pointed out that confined expansion values are very much higher than those of unconfined expansion. The latter are approximately 48 per cent of the confined expansion values.

The outstanding and most desirable feature of these sands is their high resistance to heat shock at 2500° F. It is also of interest to note from the expansion graphs the difference in values between the exposure at 1500 and 2500° F and also those between the core and molding sands. It appears evident that the clay and wood flour additions contributed considerably to the lower values of the molding sand mixture.

Acknowledgments are made to A. C. Ross, vice president and works manager of the Buffalo Works of the Worthington Corp., for his permission to publish this article; to Walter Hunsicker, foundry superintendent, for his helpful suggestions and Dey E. Cutler, J. S. McCormick Co., for having our sand test results confirmed by the Harry W. Dietert Co.

Offers Steel Castings Specification Chart

Standard specifications for more than 70 designated classes of steel castings are incorporated in a new summary chart compiled by Steel Founders' Society of America, 920 Midland Bldg., Cleveland 15. Information includes types of heat treatment, chemical compositions and mechanical properties of varying specifications, with reference data on specific tensile strength, yield point, elongation, reduction of area, bend, impact hardness and other indicated test procedures.

ASTM Reaches 50th Year

American Society for Testing Materials, Philadelphia, this year marks its 50th anniversary. Since its formal incorporation in the Commonwealth of Pennsylvania, Mar. 21, 1902, ASTM has concentrated its work on the promotion of knowledge of engineering materials and the standardization of specifications and methods of testing.

At present the society has about 2000 main committees, sections and related subgroups. The fact that committees are made up of technical men representing both producer and consumer and a third independent or general interest group, is one of the basic reasons for the widespread acceptance of ASTM standards.

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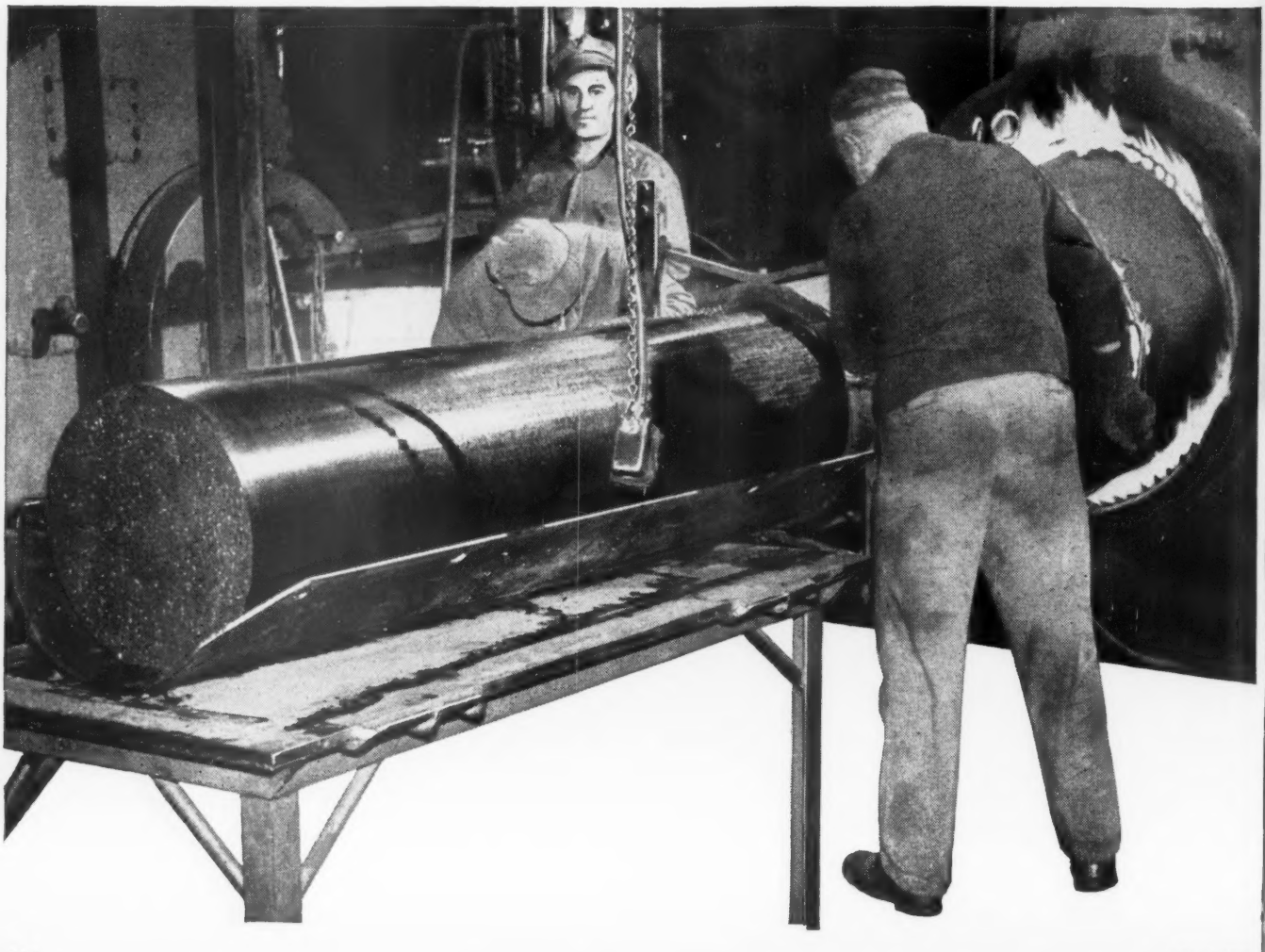

STANDARDS FOR STORAGE, HANDLING AND PROCESSING OF MAGNESIUM IN FOUNDRIES

Storage of Pigs, Ingots and Billets

Magnesium pigs, ingots and billets are not easily ignited but if exposed to fire of sufficient intensity they will burn.

Good storage arrangement is important. The size of piles should be limited and aisle widths should be based on the height of the piles.

YARD STORAGE: In open or yard storage magnesium ingots should be carefully piled on firm and approximately level areas to prevent tilting or toppling. Storage areas and yard pavements should be well drained and no combustible flooring or supports should be used under the piles. The quantity stored in one pile should be kept to a minimum but in no event should the amount in one pile exceed 1,000,000 pounds. Aisle widths should be not less than one-half the height of piles; aisle widths equal to the height of piles are recommended. Readily combustible material should not be stored within 10 feet of any pile of magnesium ingots and accumulations of trash should not be permitted in the magnesium storage area. An open space equal to the height of piles plus 10 feet should be provided between the stored magnesium ingots and adjoining property lines where combustible material or buildings are exposed.

BUILDING STORAGE: Storage in noncombustible buildings is preferable. Floors of buildings used for magnesium ingot storage and supports used under piles of magnesium ingots should be noncombustible. Floors should be well drained to prevent the accumulation of any water in puddles or pools. Magnesium ingot storage should be restricted to the first or ground floor level and there should be no basement or depression below the magnesium storage into which water and molten metal may flow or fall during a fire. The quantity stored in one pile should be kept to a minimum but in no event should the amount in one pile exceed 500,000 pounds. The same recommendations for width of aisles given for yard storage are applicable to building storage. Where the building is combustible or the magnesium storage is exposed by other combustible material automatic sprinkler protection should be provided.

Melting and Casting

Good foundry practice is to locate melting operations in buildings of noncombustible construction preferably with high roof and adequate ventilation. Floors shall be noncombustible. Flame-proofed clothing, high foundry shoes, and adequate face protection should be used by operators.

Moisture and foreign material are dangerous where any molten metal is present, and all metal added to melting pots should be thoroughly predried. Floors around melting units should be of hard burned or vitreous paving block, cast iron or steel plate, kept clean and free of moisture. Furnace settings must be kept dry and free from iron scale. Fuel supply lines should have remote valve controls.

Leaking pots and crucibles that allow molten metal to contact concrete or hot iron scale are dangerous. Pots and crucibles should be inspected regularly and discarded as soon as there is any evidence of possible failure. Safety run-off containers should be provided for melting pots and crucibles.

Ladles, skimmers and sludge pans must be thoroughly predried and hot before contacting molten metal.

Extreme care should be exercised in pouring magnesium castings to avoid spillage where moisture on floors or other surfaces may cause explosions. Permanent molds should be thoroughly preheated before pouring. It is considered good practice to purge all permanent molds with sulfur dioxide prior to use and between pourings.

With the exercise of care to keep water from reaching molten metal, water spray applied with caution can be used safely to fight fires in combustible material in the vicinity of melting pots. A solid stream of water injected into molten magnesium or any body of molten metal will produce a violent explosion.

Rough Finishing of Castings

Sawing and coarse grinding of magnesium castings may produce sparks capable of igniting the fine dust and such fires may communicate to castings. Provisions should be made for the proper removal of dust as it is produced at saws and grinders and for the immediate quenching of sparks that may be produced by such equipment.

Good housekeeping is essential.

All electrical equipment, including motors, shall be of the type approved for use in Hazardous Locations, Class II, Group E, and installed in accordance with the requirements of Article 500 of the National Electrical Code. All other possible sources of dust ignitions should be eliminated from the area. Work benches and other equipment should be noncombustible. If wood table tops or other fixtures of wood or combustible material are considered necessary they should be treated to render them fire retardant. Operators should wear caps and hard finished or flameproofed clothing.

FIRE PROTECTION: (a) A supply of approved extinguishing powder for magnesium fires should be kept within easy reach of every operator performing a machining, grinding or other operation on magnesium. The powder should be kept in covered metal pails with easily removable covers and a hand scoop provided at each pail for applying the powder.

(b) The amount of extinguishing powder needed will depend on the amount of chips or turnings involved. An ample supply should be provided to control any possible fire situation. Where conditions may permit the development of a fire requiring a large quantity of powder it should be provided in drums, and long-handled shovels provided for its use. Heat resistant gloves and face guards should be available for protection of the personnel applying the powder.

(c) Containers of fire extinguishing powder for magnesium fires should be plainly labeled.

(d) The recommended method of applying powder is to spread it evenly over the surface of the fire to a depth of one-half inch or more without scattering the burning metal. If smoking continues in spots more powder may be added and stirred in gently to bring the powder into contact with the fire. Where the burning metal is on a combustible surface the fire should be first covered with powder, then a two-inch layer of powder spread out nearby

STANDARDS FOR STORAGE, HANDLING AND PROCESSING OF MAGNESIUM IN FOUNDRIES

and the burning metal shoveled onto this layer, with more powder added as needed.

(e) Substantially constructed tight tote boxes (with or without covers) have considerable confining effect on the burning of magnesium therein. This confining effect makes the use of such tote boxes of definite value in the control of magnesium fires by sprinklers. Noncombustible tote boxes are preferred. Tote boxes should not be used as containers for chips or dust.

Heat Treating

Fire may occur in furnaces or ovens when magnesium is being heat treated if there is a lack of proper temperature control or if the surface of the work is not free from dust or fine particles of metal. Failure to provide for proper circulation of the heated air in the furnace may result in overheating or higher temperatures in certain zones than that indicated by the thermocouples that operate the temperature control devices.

A standard procedure for checking the uniformity of temperature at various points in a heat-treating oven should be established. Ovens should be tested initially and at regular intervals to eliminate localized high temperature areas.

Ovens should be properly and tightly constructed. Gas or oilfired ovens should be provided with combustion controls. All ovens should have two sets of temperature controls operating independently. One set should be adjusted to operate at a temperature slightly above the other so that in case the first control fails the other may be expected to operate before ignition of the magnesium. It is advisable to provide heat-treating ovens with sulfur dioxide atmosphere, which serves to retard the ignition of the magnesium.

Magnesium parts to be put in a heat-treating oven should be carefully freed of magnesium turnings, chips and saw dust.

There should be strict adherence to the heat-treating temperature cycle recommended by the alloy manufacturer.

Magnesium fires in heat-treating ovens can best be controlled with powders or gases approved for use on such fires. If powder is used, burning metal should be removed where feasible from the oven before application of the powder. Where gas is to be used permanent connections to the oven or entry ports should be provided.

> NOTE: Preliminary tests and some limited experience indicate that boron trichloride gas is a suitable extinguishing agent for magnesium fires in heat treating ovens.

Water may be used to fight fire in combustible materials nearby but should not be used in fighting fire in the ovens. Where automatic sprinkler protection is provided a deflecting shield or hood shall be provided over the oven to prevent sprinkler water from getting into the oven.

Storage of Castings

HEAVY CASTINGS: (a) Large castings (25 pounds or more) having walls of heavy cross section (at least ¼ inch) may be ignited after some delay when in contact with burning magnesium chips or when exposed to fires in ordinary combustible materials.

(b) Buildings used for the storage of magnesium castings should preferably be noncombustible, with particular attention given to the construction and maintenance of floors. Single-story storage buildings with well-drained noncombustible floors are recommended. There should be no basement or depression below the magnesium storage into which water and molten metal may flow or fall during a fire.

(c) It is desirable to inspect all magnesium castings prior to storage to see that they are clean and free from chips or fine particles.

(d) The size of storage piles of heavy magnesium castings either in cartons or crates or free of any packing material should be limited to 1,250 cubic feet. Proper aisles should be maintained to permit inspection and effective use of fire protection equipment. Aisle widths should be not less than one-half the height of the piles; aisle widths equal to the height of the piles are recommended.

(e) When the building in which magnesium castings are stored is of combustible construction or cartons, crates and other combustible packing material around the castings constitute a fire hazard, automatic sprinkler protection is recommended. Attention is called to the hazard of explosion if storage conditions permit molten magnesium to drop into pools of water.

LIGHT CASTINGS: (a) Light castings, particularly in large quantities, should be stored in noncombustible buildings. Segregated storage is desirable because a slow burning fire in nearby combustible material may develop enough heat to ignite thin-section magnesium, producing a well-started magnesium fire before the operation of automatic sprinklers. Special importance attaches to prompt fire detection and alarm service, prompt sprinkler operation, and the avoidance of obstructions to sprinkler distribution which would permit combustible materials to continue to burn under sprinkler discharge and result in ignition of magnesium.

(b) Piles of stored light magnesium castings, either in cartons or crates or without packing, should be limited in size to 1,000 cubic feet. Light castings should be segregated from other combustible materials in so far as possible, and kept away from flames or sources of heat capable of causing ignition.

(c) Recommendations for fire protection where heavy castings are stored are generally applicable for light casting storage.

Handling and Disposal of Scrap

Magnesium chips and turnings, wet or damp with water, present a definite fire and explosion hazard when attempts are made to melt or process them in foundry operations. If shavings, chips and other fine scrap are included with scrap to be remelted special precautions must be taken to insure that the mixture is thoroughly dry and contains no water-oil emulsion. Wet chips can be dried by spreading in a layer about 2 inches thick where warm air can be passed over them. Care should be taken to see that no pieces of scrap that contain moisture are thrown into a melting pot containing molten metal. Scrap to be disposed of should be burned in thin layers at a safe location where surrounding combustible material will not be ignited by heat or flying pieces of burning metal.

Complete standards may be obtained for a nominal sum from National Fire Protection Association, 60 Batterymarch St., Boston 10.

Electric Furnace Melting

(*Continued from page* 109)

110 heats, and cost $4.41 per ton of steel. Freedom from cracking is absolutely essential in the refractory lining, because if a crack forms, the steel comes in contact with the current-carrying coils and short-circuits them, and if the current is not immediately cut off, it will burn through the coils and go into the pit.

The capacity of coreless induction furnaces varies from as little as 2 up to 16,000 lb or somewhat over. The sizes below 25 lb or so take current from mercury-arc converters, instead of motor-generators, at frequencies around 15,000 or 18,000 cycles. As a rule, foundries prefer the rather small sizes, holding from 600 to 4000 lb. The power input is usually such that a heat of 1000 lb is melted and superheated in a little under an hour, so that a small furnace is capable of a comparatively large output. Wilcox gives the power consumption of an installation melting 1000 lb of 18-8 in 58 minutes, as 779 kwh per ton of metal.

Bath Uniform in Composition

As the bath of an induction furnace is about as deep as it is wide, or even a little deeper, refining the charge by working the slag is both slow and expensive. The action of the electromagnetic forces in the pot produces a vigorous stirring action, the metal moving both up and down in the center and circulating along the walls, as shown in the sketch, Fig. 2. The movement of the metal is sufficient to hump the surface up in the middle, to an extent that varies with the current input. As a result, the melted bath is very uniform in composition.

A further advantage, not contemplated when the furnace was first developed, is that in pouring directly into molds, the slag remains in the back part of the pot, and it is not necessary to hold it back from the lip with a skimmer. Until the furnace is nearly empty, therefore, the slag can be kept from running into the molds far better than is possible when pouring from a ladle and holding the slag back with a skimmer.

As there are no electrodes, the metal in the furnace is in contact only with the lining and the air, and therefore can be melted with almost no change in composition. Enough slag-making material is generally added with the charge to form a thin layer of slag over the metal, to protect it from oxidation by the atmosphere. In particular, steels that tend to absorb carbon to a harmful degree in

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the arc furnace, can be melted without any increase of their carbon content. This makes the induction furnace particularly useful for the manufacture of stainless steels of the 18-8 type, many of which develop their greatest usefulness only when their carbon content is kept very low.

When these steels are made entirely from new materials, the arc furnace will melt them satisfactorily, though an occasional heat will have to be "blown" with oxygen, because of undue pick-up of carbon from the electrodes in melting down. If 18-8 steel scrap makes up a considerable part of the charge, as it usually must in steel foundries, it is very difficult to keep the carbon within proper limits, when melting in an arc furnace, and practically every melt must be oxygen treated, with considerable loss of chromium, if the carbon is to be correct. As no such trouble occurs in induction melting, some makers of these high-alloy steel castings use that method in preference to arc furnaces, feeling that the slight extra melting cost is far more than offset by the certainty of having no trouble with carbon pick-up.

When heats are to be made of *all* high-alloy steel scrap, the only really satisfactory unit for the purpose is the induction furnace, since there is

TABLE IV—ALLOY RECOVERY

Element	% Recovery
Carbon	100
Chromium	99
Nickel	100
Manganese	90
Silicon	94
Molybdenum	95
Columbium	92
Selenium	89

no chance of carbon pick-up, and the recovery of the alloys in these units is almost complete. Wilcox[16] gives the figures shown in Table IV for the recovery of alloys in melting in a coreless induction furnace.

In the arc furnace, if a charge of 18-8 or similar steel absorbs extra carbon, the use of iron ore or mill scale to lower the carbon content involves the loss of a prohibitively high proportion of the chromium content. It is obvious, therefore, what an advantage the coreless induction furnace has in producing these steels, since carbon absorption in melting is never encountered, unless by some mistake carbon is introduced into the pot. Charges proportioned to give the correct amount of the alloying elements, and including any amount of scrap up to 100 per cent, are melted down in these furnaces very quickly, brought up to any desired temperature, and poured with no further

(*Continued on page 242*)

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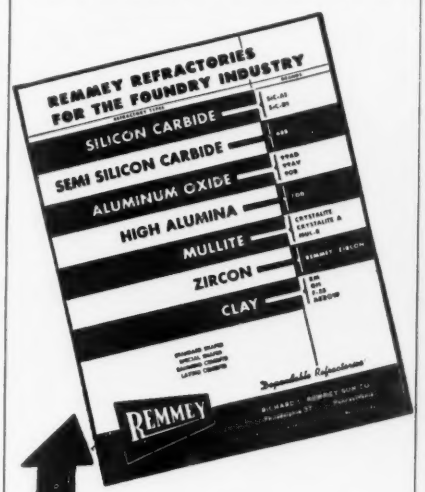

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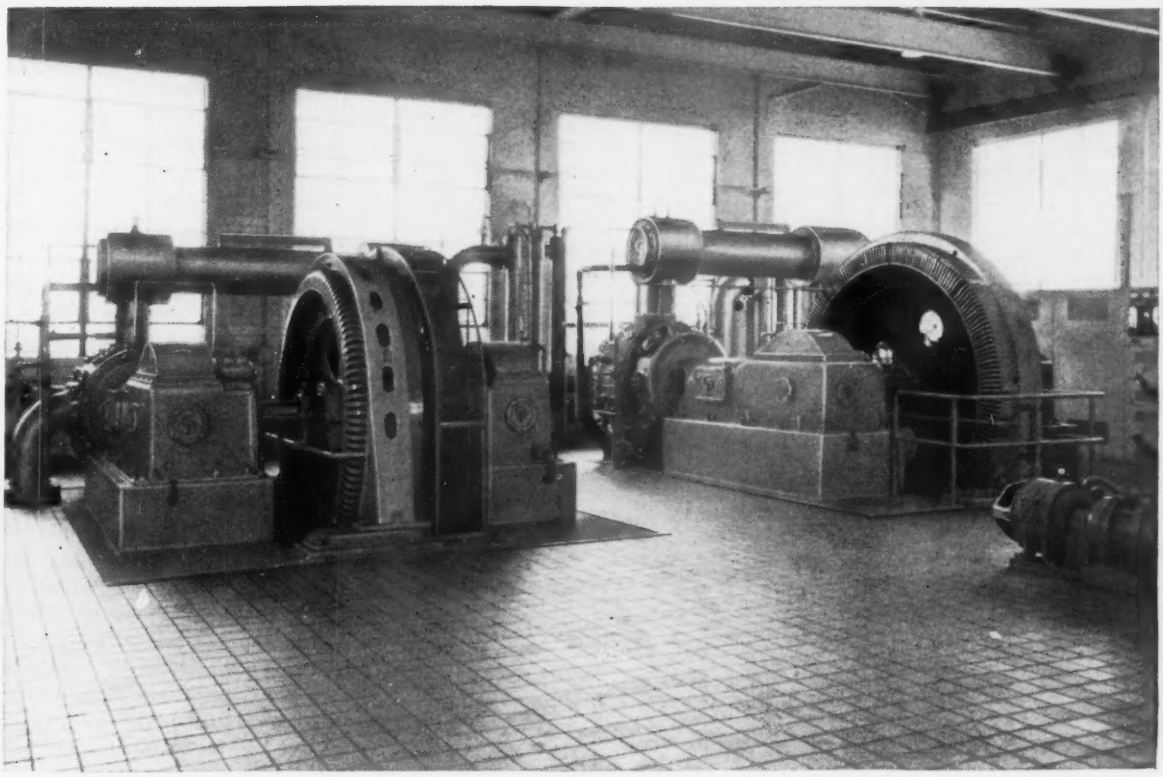

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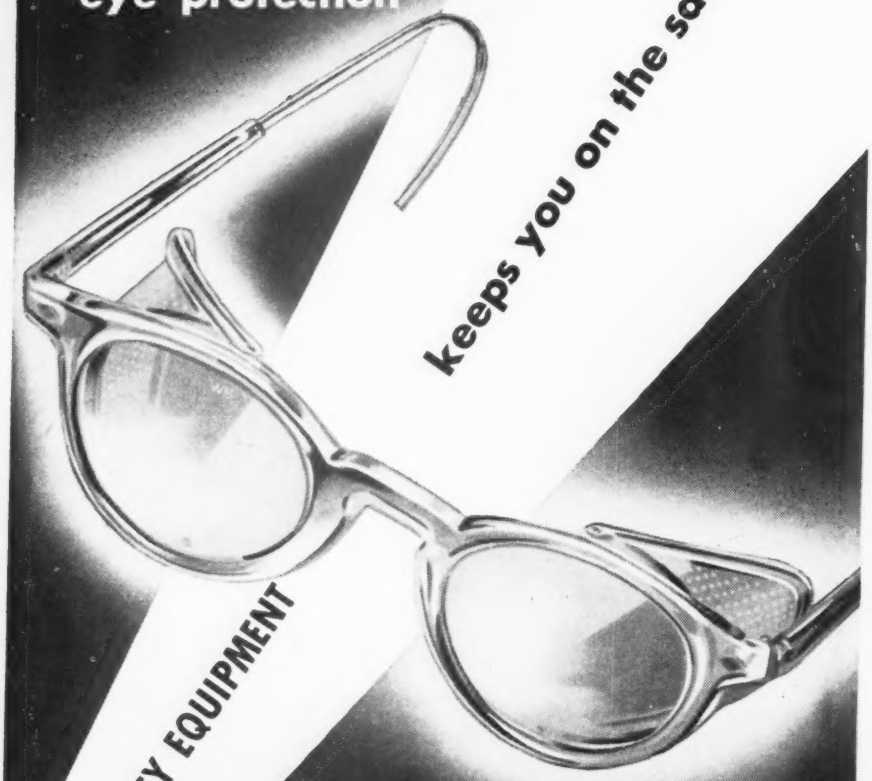

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(*Continued from page* 240)

handling except to scrape the excess slag off over the lip.

When very light castings are to be produced, the induction furnace has the further advantage that it can be arranged so that the molds are poured directly from the furnace, without the loss of temperature involved in the use of ladles or small shanks.

Of late years, the oxygen lance has been used successfully to reduce the carbon in heats of 18-8 and similar alloy steels. This practice, which so far as the author is aware, has been applied only in arc furnaces, effects the reduction of the carbon content with much less loss of chromium than when iron ore is used for the purpose. The recovery of chromium, however, is nowhere near as high as in induction furnaces. The chief usefulness of the method in steel foundries, therefore, is in remelting high alloy steel scrap whose carbon content is already undesirably high, or which is so coated with oil, grease or other carbonaceous material that in any type of furnace it will absorb too much carbon in melting.

Chromium Absorbed by Slag

Though a good deal of chromium is oxidized and absorbed by the slag in this method, yet it is the only possible way to re-convert badly off-analysis or very dirty scrap. Naturally, arc furnace melts of good material that have accidentally absorbed excess carbon, can also be salvaged by means of the oxygen lance. Following the oxygen "blow," additions of powdered ferrosilicon reduce part of the chromium oxide from the slag and return the chromium to the bath. This practice will be described in detail elsewhere.

Plain carbon and low-alloy steels can be made much cheaper in arc furnaces than in coreless induction units, and the latter are seldom if ever used for the purpose. The technique of producing the several types of high alloy steels generally made in them, will be discussed in sections devoted to a description of the manufacture of special steels.

The so-called triplex (cupola-converter-electric furnace) process developed by W. G. Kranz, National Malleable Steel Castings Co., in 1913-1914, was used to some extent during the recent war, with the object of supplying a steady supply of steel to feed continuous molding and pouring installations. The steel-making equipment consisted of several cupolas, three or more side-blown con-

verters, and one or two electric furnaces, each capable of holding the metal provided by a number of converter "blows." With two converters running steadily and keeping an electric furnace full, steel is taken from the latter as fast as required, and poured into molds on conveyors, generally by means of tea-pot ladles. The furnace is completely emptied only at intervals of several days.

As a matter of historical interest, the author recalls a somewhat similar installation in an Italian steel foundry, which consisted of a battery of small side-blown converters, and a fuel-fired mixer capable of holding the steel from thirty or forty "blows." The latter was used because the electric furnaces then available were very small affairs, and fuel firing was the only possible way to keep a large mixer up to steel melting temperatures. As early as 1908 or 1909 this foundry successfully produced ship frame castings for the Italian Navy, some of which required 60 or 70 tons of steel. Except that the mixer was used only to hold the metal and not to refine it in any way, this method somewhat resembled conventional converter-open hearth duplexing as carried out in the rolling mills in order to increase open hearth production.

Small Capacity Transformers

When electric furnaces were first introduced in this country, they were provided with transformers of such small capacity that melting charges of cold scrap in them was a slow and costly procedure. One of the first commercially successful installations, at the (then) Halcomb Steel Co. plant in Syracuse, utilized a tilting open hearth furnace to melt scrap and pig iron, refining the molten metal in a basic electric furnace of capacity much smaller than that of the open-hearth furnace. The latter was operated on a continuous basis, scrap and pig being charged as often as a ladle-full of steel was taken off to feed the electric furnace.

As late as 1913, either a tilting open hearth furnace or a battery of converters, feeding molten metal to electric furnaces, seemed the most economical way to produce commercial tonnages of electric furnace steel. In the first edition of his *Steel Foundry*, therefore, the present author devoted considerable space to a discussion of the method as a means of reducing the cost of electric furnace steel. Continuous pouring installations for the production of small steel castings, or course, had not then even been dreamed of, and

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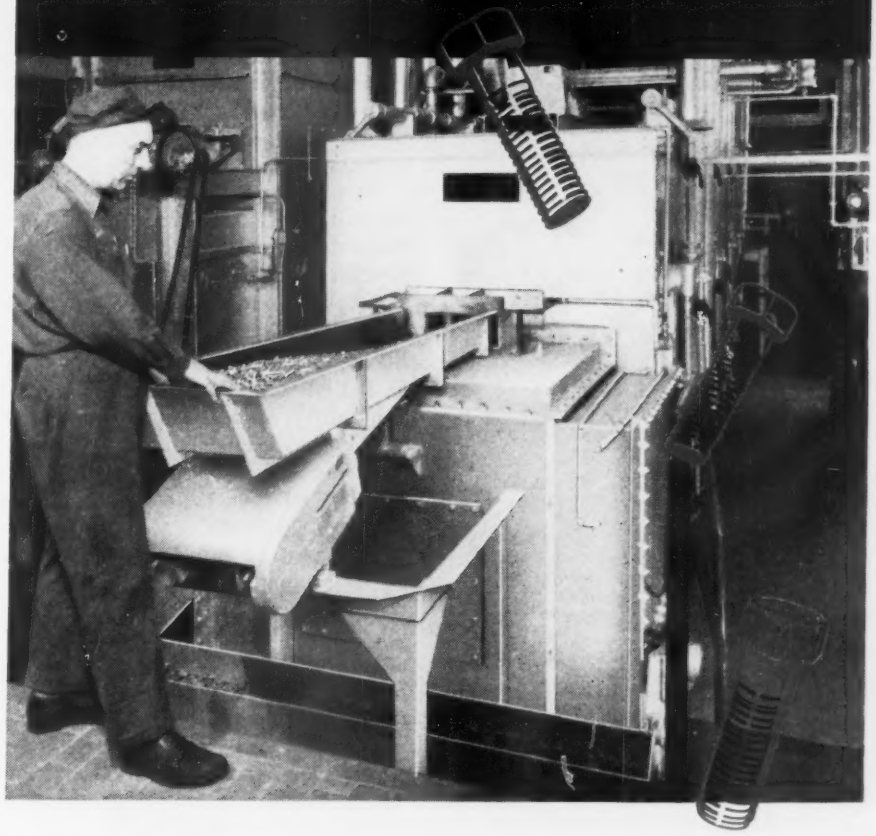

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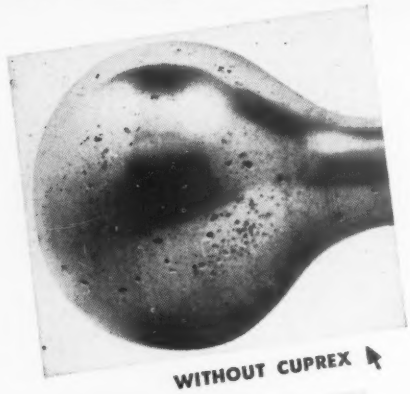

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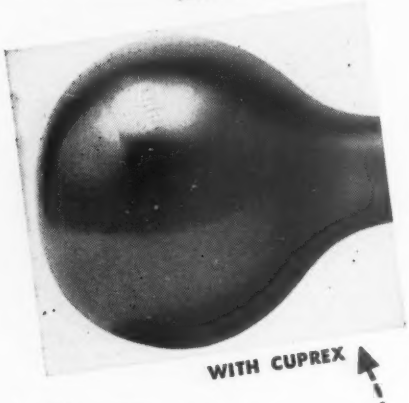

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cost saving was the sole reason for advocating duplex or triplex installations.

At that time electric furnaces were always run "basic," and there was no known means of reducing the sulphur content of converter steel by treatment in the ladle. The author, therefore, confined his discussion to the use of basic electric furnaces to deoxidize, dephosphorize and desulphurize acid converter steel. Except that the actual melting of the charge in the electric furnace was to be dispensed with, the procedure contemplated was regular two-slag basic electric practice, the furnace being completely emptied each time a charge was finished.

When the electric furnace is used as a high temperature mixer, to hold a quantity of steel and feed a continuous pouring unit, its contents must be constantly ready for use, with or without ladle additions. An iron ore boil to eliminate gases, therefore, cannot be employed, as it would be very expensive to build the carbon up and oxidize it out again at regular intervals. Several possible methods may be followed. In one, the electric furnace bath may be held at approximately the composition of the converter blown metal, and the carbon, silicon and manganese be brought to the desired point by additions to the successive ladlesfull taken to the pouring floors.

Carbon May Be Adjusted

As this would necessitate the maintenance of a very high temperature in the electric furnace bath, the carbon may be adjusted by additions to the transfer ladle or to the furnace itself, each time a converter blow is poured in. The manganese and silicon would then be added in the pouring ladles. Lastly, the manganese, silicon and carbon of the converter metal may be brought to approximately the composition desired in the finished steel, and maintained at that point in the electric furnace, only very small additions being made to the pouring ladles. To keep the composition uniform under these conditions, a practically neutral slag must be maintained in the furnace.

In the second and third methods, deoxidized or partially deoxidized steel is held for prolonged periods at a high temperature. The metal, therefore, is subjected to much the same conditions as those that obtain in heats of electric furnace steel melted "flat," at about the desired final composition, and finished without an oxidizing boil. As already explained, steel so handled absorbs a great deal

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of gas, which can be kept from coming out of solution and producing porous castings, only by liberal doses of aluminum. Because the dissolved gases are not eliminated from the steel as they are in regular practice, it has often been found that tensile test pieces of triplex steel break with what is known as a "rock candy fracture," and show deficient elongation and reduction of area. This condition has been ascribed to the presence of excessive amounts of dissolved nitrogen.

In describing the triplex method, the late A. W. Gregg[17] stated that by using a basic electric furnace, the converter metal might be desulphurized in the transfer ladle, and then dephosphorized in the electric furnace. This of course would demand that an oxidizing slag be built up in the furnace, and taken off at regular intervals. Therefore, the steel would be kept at a low content of carbon, manganese and silicon and all deoxidation and alloy additions would be carried out in the pouring ladles.

Only Economical Method

When metal is to be withdrawn from the furnace at regular intervals, this is obviously the only economical way of dephosphorizing the steel in a basic electric furnace, since to bring the whole charge to the final composition for each ladlefull, and then boil the manganese, silicon and carbon out of it with the dephosphorizing slag, would involve a tremendous waste of costly alloys.

Mr. Gregg also suggested the possibility of adopting the Yocum method of dephosphorizing converter steel in the transfer ladle, before charging it into the electric furnace. That process, however, has not been generally adopted, and in triplex installations dephosphorizing is not attempted. Instead, low phosphorous scrap and pig are melted and blown, the excess sulphur absorbed from the coke in the cupola is eliminated by ladle treatment with alkalies, and the metal in the electric furnace is brought to the desired composition, at least in carbon, and sometimes also in silicon and manganese, as fast as converter blows are poured in. The cupola charge is generally composed of a high proportion of steel scrap, with silicon alloys or "silvery" pig iron added in such amounts as to raise the silicon content of the cupola metal to between 1.50 and 2.00 per cent.

Only a small amount of power is used in the electric furnace when operated in this way, and the total cost of the steel produced is fairly

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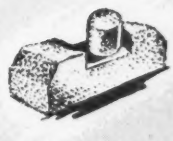

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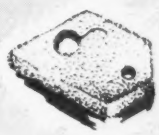

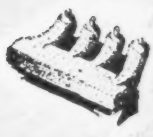

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low. Though basic electric furnaces are generally, though not necessarily used, the quality of the steel made is not as high as that of electric furnace steel made in the usual way by melting and refining cold scrap.

To produce really high grade electric furnace steel by the triplex method, each heat should be finished independently, as contemplated by the author when he advocated the method in 1913. This would necessitate the use of a number of small furnaces, in which the molten metal from the converters would be worked just as if it had been melted in the furnace, the entire charge being emptied out as in regular practice. To schedule the operation of an installation like this in such a way as to furnish a steady supply of steel to the pouring unit, would be much more difficult than when using the regular triplex method. The crew required for a given tonnage, too, would be much larger and the current consumption higher, so that the operating cost might well be only a very little lower than that of furnaces of the necessary capacity, melting and refining cold scrap.

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Work Measurement Study

Bulletin 505, containing results of a Los Angeles survey, work measurement project, has been published by Ralph M. Barnes and W. E. Carroll, University of California, Los Angeles. Object of the study was to determine operator performance rating, time study allowances, and standard time for 13 different operations as established by industries located in Los Angeles and vicinity. Procedures in conducting the study are outlined and results are summarized.

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Aluminum-Nickel-Bronze

(*Continued from page* 97)

tion 50S2(Ord), is used for preparing sand molds for aluminum-nickel bronze castings. The sand has the following properties: Grain fineness —10-130; clay content—12-15 per cent; moisture content—6 per cent; permeability—25-35 per cent; surface hardness—75-85. The molds are skin dried (about ⅛-in. deep) by a gas torch carefully run by hand over the mold surface until steam stops forming. When a large number of molds are involved, they are dried under drying lamps for 5 minutes.

Cores are made from the following mixture prepared in a muller: 80 qt No. 1 Albany sand, Bureau of Ordnance Specification 50S2, Class 8; 30 qt Ottawa sand, Bureau of Ordnance Specification 50S2, Class 20; 5 qt resin binder; 1 qt core oil; 4 qt water. Mixture is rammed into core-boxes, removed from the box and baked in core ovens at 350 to 400°F. Baking time increases with core size and varies from 1 to 4 hr. For example: Cores with ½-in. thickness or diameter and under are baked one hour, cores with 5-in. thickness or diameter and over are baked 4 hr. When cores of different sizes are placed in the ovens at the same time for baking, bake time is determined by the largest core.

Chills are used to control shrinkage in areas where heads and risers cannot be applied to furnish necessary feeding. Clean gray cast iron, copper and carbon plates with thickness twice that of the casting section serve as mold chills for flat areas. A 1-in. thick moldable chill mixture of the following composition is used as a chill on intricate contours: 792 parts by volume of crushed silicon carbide crucibles, 28 parts by volume of western bentonite, 16 parts by volume of cereal binder, and water 7-9 per cent by weight. The thicknesses of chill materials referred to have been found necessary to insure freedom from blow defects at the chills due to insufficient chill.

Heads and Risers—Because of its high shrinkage characteristics and short freezing range, aluminum-nickel bronze requires a liberal use of heads and risers similar to manganese bronze to insure adequate feeding. No fixed rule is available for size selection of heads and risers. The location and size of heads and risers are chosen so that they are full of molten metal and are the last parts to solidify in the mold. Shrinkage is thus concentrated in the heads and risers. Examples of Naval Gun Fac-

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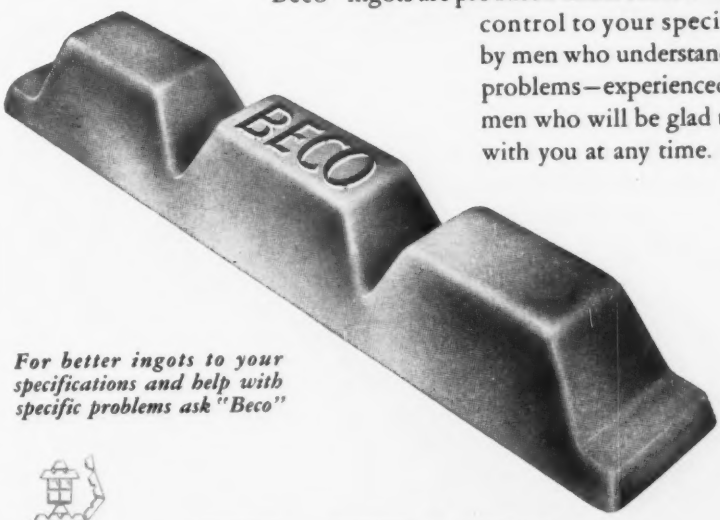

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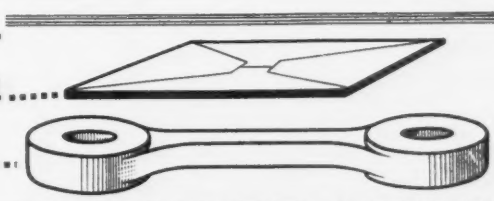

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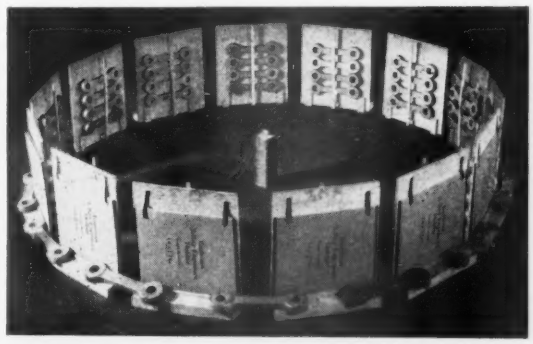
Illustration shows 60 steel castings being photographed simultaneously. The gamma rays, flying in all directions, go through all the castings at once, making 60 exposures of the 60 castings



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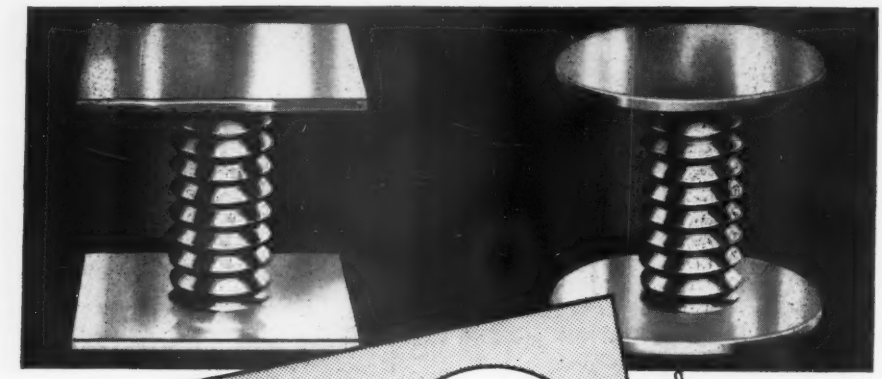

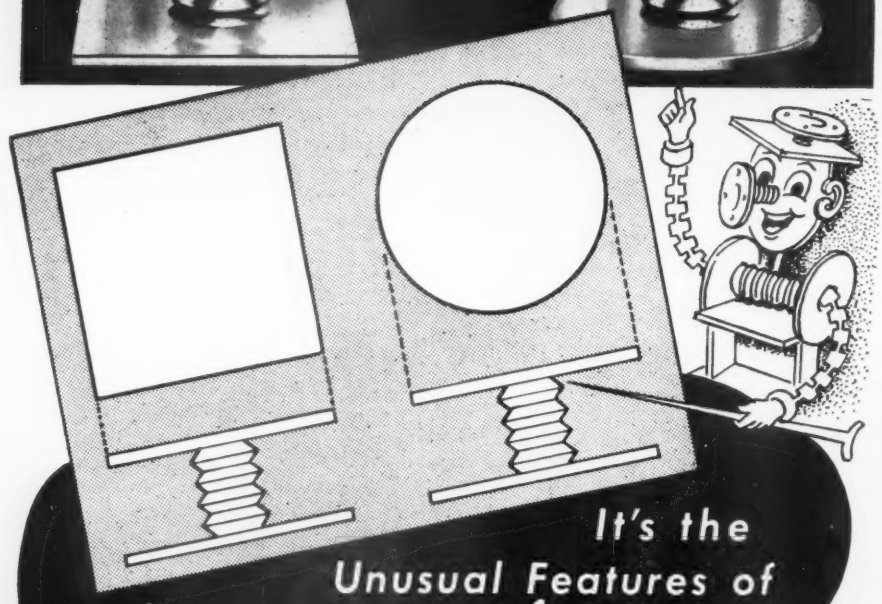

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tory practice are illustrated in Figs. 1, 4 and 7. It should be noted that the risers are attached with generous fillets to the casting to prevent reverse feed from the casting to the riser.

Weight of the heads and risers is generally larger than the weight of light castings produced and slightly less than the weight of heavy castings. Per cent yield for light aluminum-nickel bronze castings is approximately 30 per cent and for heavy castings 60 per cent. The average per cent yield is about 50 per cent at the Naval Gun Factory. This low yield is due mainly to the large heads and risers required to produce aluminum-nickel bronze castings. A comparison of Figs. 1, 4 and 7 with Figs. 3, 6 and 9 showing aluminum-nickel bronze sand castings with and without sprues, risers and gates visually demonstrates the low yields obtained with this alloy. The weights and per cent yields for the castings shown are given in Table II.

Gating — The susceptibility of molten aluminum-nickel bronze to the formation of dross and scurf makes gating of major importance for producing sand castings from this alloy. Gates are designed so that the molten alloy enters the mold quietly without turbulence or agitation at the bottom of the mold, fills the mold by displacing the air and carries dross and scurf up into the heads and risers. The gates are located so that the molten alloy entering the mold can have a long non-turbulent flow before being interrupted by cores or protruding mold sections.

Naval Gun Factory gating practice is illustrated in Figs. 1, 4 and 7. The inverted horn gates shown in Figs. 1 and 4 have been found to furnish an excellent means for obtaining the desired non-turbulent quiet flow for molten aluminum-nickel bronze. Tilting the mold to keep the gates at the lower end during pouring is also practiced at the Naval Gun Factory. This is another means for insuring quiet flow of molten alloy into the mold. The raised end of the mold is slowly lowered during pouring so that at the end of pour the mold is flat.

Aluminum-nickel bronze castings usually produced at the Naval Gun Factory are made to meet Federal Specification QQ-B-671a, Class D (heat treated) with the requirements given in Table III. To meet the requirements the composition sought is: Cu-82.5 per cent, Al-10.5 per cent, Ni-3.5 per cent and Fe-3.5 per cent. Castings made from the aluminum-nickel bronze alloy are heat treated

as follows:

1. Heat to 1600°F (hold 1-3 hr).
2. Water quench.
3. Heat to 1200°F (hold 1-3 hr).
4. Water quench.

Chemical analyses are made on separately cast test samples from each melt. Fig. 10 gives the results of statistical analyses of chemical compositions for Naval Gun Factory aluminum-nickel bronzes. The average composition is shown to be: Cu-82.80 per cent, Al-10.04 per cent, Fe-3.92 per cent, Ni-3.18 per cent, Mn-0.17 per cent, Sn-less than 0.02 per cent and Pb-less than 0.02 per cent.

Mechanical properties of Naval Gun Factory aluminum-nickel bronze sand castings are determined by means of separately cast keel type sand cast test coupons poured from each melt. Molds for tension test bars are made from core sand mixture and baking procedure described under mold materials. The legs of the keel bar casting are cut off, heat treated with the production castings, machined to 0.505-in. diam tension test specimen and tested. Statistical analyses of tension test results are shown in Fig. 11 with average properties as follows:

Tensile strength 99,220 psi, yield strength 54,480 psi, (0.005 in. per in. extension under load), and elongation in 2 in. 10.2 per cent. No difference has been noted in properties of aluminum-nickel bronze produced by the three different melting procedures.

Discussion—The Naval Gun Factory has produced aluminum-nickel bronze sand castings ranging in weight from ¼ to 300 lb, the average casting weighing 70 to 80 lb. If required, larger castings can be produced using the same procedures described in this report. The Naval Gun Factory has experienced 1 per cent overall loss of aluminum-nickel bronze sand castings due to casting defects. Chemical compositions are controlled by careful selection of raw materials and range as shown in Fig. 10. Mechanical properties meet specified requirements in 92 per cent of the heats; greatest difficulty is encountered in meeting the 6 per cent minimum elongation requirement. Low elongation values have been found to be associated with high aluminum content.

The authors wish to express their appreciation to the following U. S. Naval Gun Factory personnel for their co-operation in the preparation of this article: Lewis H. Fawcett, principal metallurgist, J. E. Crown, production manager, E. J. Bush, foundry master mechanic, and P. O. Ady, foundry chief quarterman.

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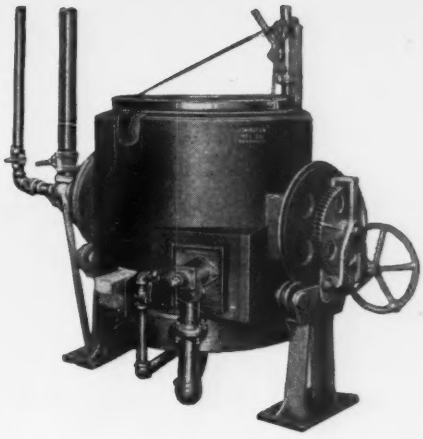

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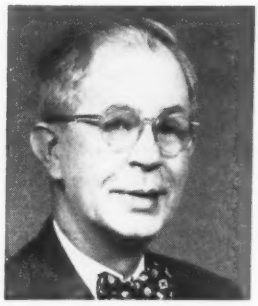

By RALPH L. LEE

ALMOST everyone I've talked to about the International Foundry Congress down at Atlantic City felt real good about the whole affair. Any number of them said "It's the best yet." While I didn't get the chance to sit in on the sessions, I did do the exhibits. And when I say *did do*, I mean each word of it.

In fact, this time I laid out a plan of attack, sort of a strategy, for I knew from previous experience what a heck of a job it is trying to see everything on a catch-as-catch-can basis. I remembered that you hardly got through the main entrance without running smack dab into Ed with a "Well I'm a son of gun, you old reprobate you, just a minute, Charley—hey Charley!—come on over here and see what I've got."

Every few feet from then on you meet everybody and their uncle all loaded down with news of other folks you both know and the goings on concerning them. Meeting the folks you know and haven't seen for a long time is probably the most important part of the show. On the other hand, seeing the show is important too—so there you are between the devil and the deep blue sea, with time a fleetin'.

Knowing the situation I was bound to run into, I laid out a plan this time—sort o' zoned the place. I made up my mind that I would stop and talk to all of my friends with no impatience to get away. But after each "I'll be seein' you," I'd go right back to where I'd left off on my exhibit tour. Following this scheme I don't think very much escaped me.

On my way home and up to the present moment I've had a satisfied feeling about the whole affair—like the one a fellow has after a darned good, substantial, well cooked and well served meal. Sometimes it seems that the more satisfying a feeling is, the harder it is to put your finger on the reason for it. Now that I look back over what I saw, I don't believe I can recall anything that was particularly startling or revolutionary. And the more I get to thinking about this fact the more certain I am that the absence of efforts to pull rabbits out of the hat by the exhibitors or of anything bordering on bally-hoo or the side show pitch was the thing that distinguished this show from any other I had seen.

Most of the exhibits and exhibitors seemed to be down to earth this time, claims seemed to be more conservative and more facts were available to back up the claims. I had the feeling that the sales folks had more confidence in themselves and their products. And speaking of products, it seemed to me that they had settled down from sort of a speculative goldberg experimental stage toward a solid and dependable machine tool perfection.

I couldn't help but think that maybe we have successfully come through another one of these fads that sweep industries — the automatic, electric eye, push button, pneumatic and wonder working rage that seemed to take hold of our equipment people a while back there.

Almost any good designer or ingenious mechanic, with the wherewithal in time and money could build a machine that would automatically shave you, wash your teeth and comb your hair while it tied your tie. But the chances are that the old law of economics would prevent the project from getting very far.

At this convention I thought I saw fewer examples of decorating standard apparatus with one gadget after another all hooked together and more work on improving the body of the apparatus itself (wear and maintenance).

There is no question in my mind that the sales presentations and product demonstrations were much better than they have been in the past. Being an old sales promotional man myself, I was tickled the way the boys got the names and addresses of the booth visitors. All you had to do was to lower one eyebrow with an unspoken question or curiosity, and before you knew it you were inside the rail getting the works and putting your name down (and pleasantly too).

Then there was another thing too —the little foundries were given a real break. With the Lee Hobby Foundry being about the littlest of the little, I would have every right to be biased in that direction and read into what I saw something that really wasn't there, but I know that this wasn't the case, for any number of other people saw the same thing I did.

Although we at our foundry are pretty well set with the goldberg sand conditioning outfit I built myself, I was very much interested in seeing sand apparatus ranging in size from wheelbarrow units on up the ladder to the almost automatic outfits for small foundries. In fact, it struck me that almost everything is now available for the smaller foundries to go as far as good sense will permit toward mechanization in keeping with the kind, quantity and regularity of their work.

With all of the sex appeal and hullabaloo about the shell molding process I felt real good about the common-sense way people were talking about it—recognizing the advan-

(*Concluded on page* 252)

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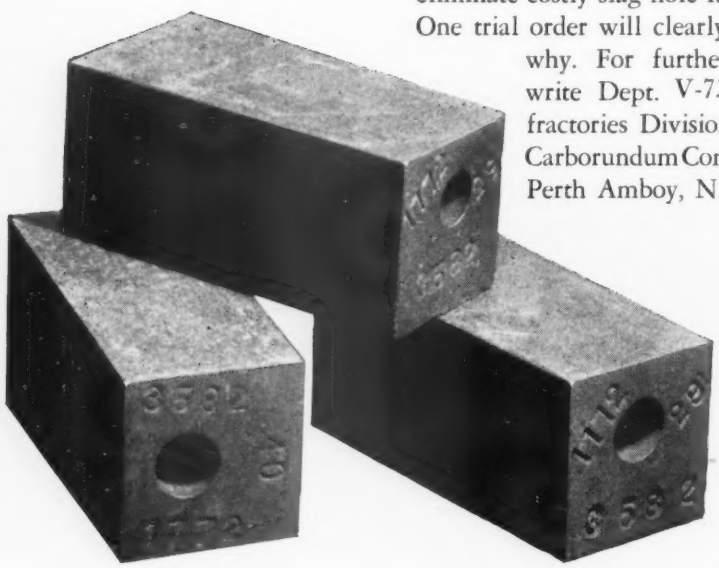

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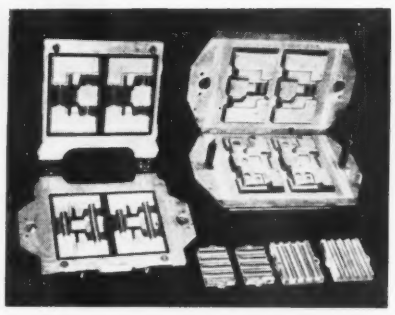

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Pressure Cast PRODUCTS

(*Concluded from page* 250)

tages but at the same time taking into account certain limitations. And, speaking of precision castings, I got a particular bang out of a frothed-up plaster demonstration. The fellow told me that the stuff had a permeability as good as sand. I'm itching to get me a sack of it and try my luck. He showed me some castings made in it I'd a sworn were die cast. This fellow was surely enthusiastic and put on a darned good demonstration. I saw it twice, the last time with a friend I brought along to watch it.

I'll have to admit that I did feel a little competitive as I watched the boys tap the little 4-inch cupola. I couldn't help but notice that it took three men to run the thing. Using the old slide rule I mathematicated that the cupola required 0.75-man per inch to keep it going. Ever since I built the Lee Hobby Foundry's 10 incher I've been saying that the operating troubles go up as the cube of the diameter shrinks.

One thing I didn't see at the exhibit—and that's bookkeeping or accounting apparatus and supplies. It seems to me that knowing where you're at costwise, production-wise, sales-wise or scrap-wise could save or make just about as much money as you could with anything else on display at the exhibit. Maybe some enterprising peddler of office supplies and equipment especially tailored and selected for the foundry will get himself a booth or two at the next convention. I hope so anyway.

Well! this can't go on forever—I still say that this last convention is one of the best ever and I think the boys on the AFS staff deserve one whale of a lot of credit for the masterful way they planned it and put it on.

Of course, with due credit to the papers read, banquet and exhibits, the real payoff was the chance to visit with all of our fellow workers in the mines—to swap tall tales with them and be assured by them that we're not the only ones who have troubles or fun. I know I got my battery all charged up to carry on full steam for quite a spell up there in the Lee Hobby Foundry.

Issues Index of Standards

American Society for Testing Materials, 1916 Race St., Philadelphia 3, has published a 274-page book listing all its 1106 standards and 704 tentatives as of December, 1951. Those are given alphabetically according to the significant word in the title as well as in numerical sequence.

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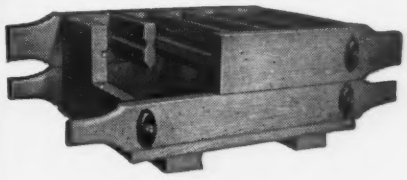
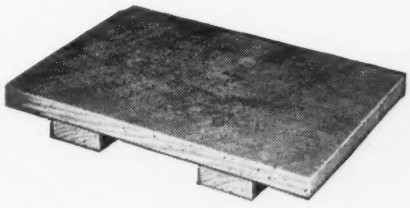


CMD WOOD FLOOR FLASKS
All sizes and shapes



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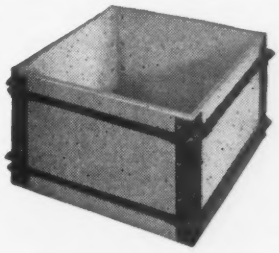

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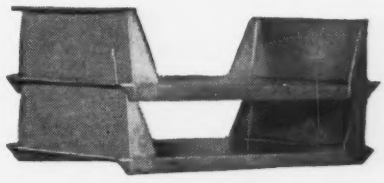

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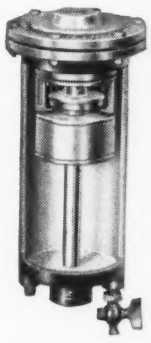

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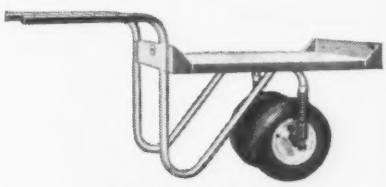

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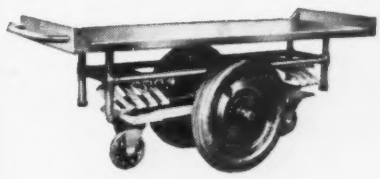

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Adventures of BILL

By PAT DWYER

Illustrations by RICHEY

THE other day, or if you want to be finicky about it, one day near the end of June, Bill and I and several hundred other sports-conscious actual, potential and ex-foundrymen hung up the shovel and the hoe and joyously invaded the halls and grounds of a country club within easy commuting distance of the city. This is an annual event where by dint of violent exercise, careful and frugal dieting and sparing indulgence in stimulating beverages, the boys shake off the inertia of the winter season, the aldermanic fronts vulgarly referred to as bay windows, and in a general way prepare for the long, hot, tough and enervating summer grind.

"Here and there in various towns," Bill said on the way home that night, "I have been taking part in these here now celebrations for about 30 years. Each time and place I find more men I don't know than men I do know. Very discouraging. Some of 'em don't even look like foundrymen. Out at the 14th hole one day in a certain city which I don't care to name, I met a lad who apparently never had missed any one of three or maybe four good substantial, stick-to-the-ribs meals since the first day he sat in a high chair, threw his empty porringer on the floor and yelled for more.

"A full round face, subdued manner and highly cultured conversation suggested that I was in the presence of at least a bishop in disguise. He deeply deplored the wide-world low standard of morality among the rising generation. Nothing like that in his younger days. Reluctantly he was obliged to confess this condition had arisen through lack of proper and adequate parental control. Through word and example, in his well considered opinion, it should be the parent's constant duty to bend the tender twigs in the way they should grow."

"A right Stout Fella," I agreed heartily. "I trust that later you threw out a few discreet inquiries touching on his name, his position and the location of the edifice where he presides over his congregation."

"All that information came in a flash when I heard the flame-tipped stream of WORDS floating out of a sand trap where his ball had landed. I knew then I had been hobnobbing with the notorious Brass Knuckles himself, dispenser of the high justice, the middle and the low, and gaffer to a congregation as tough as himself in a foundry lovingly known as the Dove Cot, and by the rougher element as the Pigeon Roost.

"Profiting by that and other examples," Bill continued, "I long ago gave up the useless sport of classifying a man by his appearance, nationality, creed, color or occupation. No more snap judgment for me. I discovered that all clergymen and all undertakers do not go around with long faces, drippy eyes and with tight-lip mouths turned down at the corners. Between professional appearances some of these lads are as merry and light hearted as so many grigs—whatever a grig is!

"According to a rather widespread belief, college professors fall into two categories: (a) Sarcastic old crabs with ice water oozing through shriveled veins and (b) absentminded fluffies who wind up the cat at night and throw the kitchen clock out through the back door. My acquaintance with members of the teaching profession is not as extensive as it is with men in the foundry industry, but it is sufficient to indicate that, like the Colonel's lady and Judy O'Grady, they are just the same under the skin.

"In support of this opinion and statement I shall read you a valued communication recently received from H. F. Dietrich on the faculty staff of Kansas State College, Manhattan, Kans. The literary gem is titled 'I—Don't—Like—Cats.' Listen, me boy, and hold your hat while I spin the tale of the foundry cat:"

Why don't I like cats? P rhaps because of the time I spent at a molding bench in the foundry wearily rattling a pile of synthetic sand through a No. 4 riddle. Apparently at every one of these periods there has been a foundry cat with an obsession that defied discouragement to use my facing box in which to bury things that might better have been buried discreetly and with becoming modesty outdoors. While pressing the final residual lumps of synthetic sand through a riddle with the bare hand it is most disconcerting to find that green strength, bond and moisture content of some lumps are definitely above the average.

First on the list of veterans was Old Mollie, back in '33. My, my, how time flies! Mollie was a messy, disreputable, long, lean and hungry gray tabby who stalked and caught rabbits in all stages of development in the flask yard, and thus provided

Foundryman seems to have a few nontechnical problems

nourishment for herself and for her frequent families without active aid or alimony from the party or parties of the second part. When the rabbit supply eventually failed to keep up with the efforts of the marauder, or marauderess, she ranged far and wide. Nothing that crawled, ran or flew was safe from her pouncing needle-point claws.

One day at the end of six months of intensive, preventive vigilance and constant but entirely useless effort to train Mollie according to the familiar nose rubbing technique, it became necessary for me to leave the floor unguarded. Although not visible she was waiting beside the core oven, sharply on the alert. The first riddle of sand contained partly concealed but definite evidence of her presence, solo and on a hurried visit.

My first and consuming impulse was to find Mollie and attempt once and for all to correct her error in judgment. To make sure the lesson would be more effective I armed myself with a good, husky 30-in. clamp with which I intended to beat her mangled body into the concrete gangway while I explained as kindly as possible that practically all recognized etiquette authorities frowned heavily on the deplorable practice of creeping in and creeping out of forbidden areas.

Alas for my noble resolution, Mollie could not be found. It was like looking for the gaffer when it's your turn under the spout and a couple of stinkeroos have edged in ahead of you. Everyone had seen her few minutes before my arrival. No one could say where she was at the moment. The next morning when the night oven was opened, we found a toasted wooly fragment, all that was left of the old trouper. Evidently she had slinked into the oven just before it was closed and then had curled up and fallen asleep.

I mourned her passing principally because she had deprived me of the opportunity to nip seven or eight of the nine lives and thus assist her on the journey to cat heaven, where, no doubt, she would find every facility, ranging from tin roofs to unguarded facing boxes and new-sand sheds.

On another memorable occasion I found myself elected to do the leg and book work for Old Gaffer Jerry out in the foundry. Jerry liked cats. Lots of cats. Naturally, according to the law of compensation, the cats practically adored Jerry. Even when the collection crept up around a dozen, he provided a separate milk dish for each cat. Very sanitary minded he was in some respects.

Clever and all as they are, you would think that cats would realize

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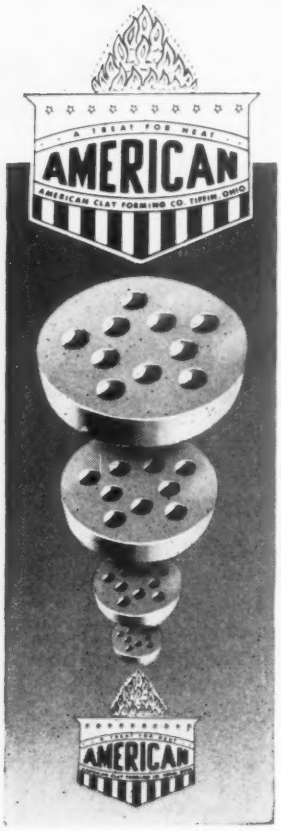
NOW... YOU CAN BE SURE OF SLAG-FREE CASTINGS WITH...

CERAMIC Strainer Cores!



★ Cut down on rejects . . . make every casting a good one— by using American Ceramic Strainer Cores. American Cores remain round and uniform during the pouring operation . . . slag remains on TOP of the core. The result? An evenly poured, slag-free casting EVERY time.

American representatives will quote prices on any size Strainer Core.

Write today for samples and descriptive literature.

AMERICAN CLAY FORMING COMPANY
TIFFIN, OHIO ★ TYLER, TEXAS
National Sales Representative
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MANFACTURERS OF SPECIALIZED REFRACTORIES FOR OVER 30 YEARS

Anderson Pattern Inc.

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ANDERSON is the Answer
to your Pattern Problems

When you are looking for production pattern equipment which is machined all-over and engineered to fit the needs of your foundry.

Write or Phone for Further Information

that of all the beasts that roam the fields, I have a special dislike for Tom and Tabby. On the other hand, Thomas and Tabitha have ideas of their own about intimates on whom to bestow their companionship and other favors. They like me.

Inevitably after a trip through the seacoal or pitch storage, or across the face of a freshly blackwashed mold, these perverted demons showed their affection by jumping up on my desk, scattering the papers, rattling their claws and rubbing their loathsome fur against my shoulder or chin. Once, to discourage this unappreciated attention, I gently pushed the cat off the desk with just enough force to enable him to turn three flip flops before his feet struck the floor.

He came back rattling louder than ever and stropped his claws on my nearest leg before he jumped back on the desk, to leave his sooty foot prints on the neatly finished production control sheet. Never once did that cat walk with his tail sticking straight out behind. In the shape of a reverse question mark it was proudly flaunted aloft like the well known Marine's flag on Iwo Jima, or the white oriflame of Navarre. In the present instance the principal use was to knock the fire and ash from my cigaret and into my shirt pocket, or through the collar opening onto my wishbone.

Excellent hunters, Jerry's cats ranged far and wide. They returned from field trips with copious evidence of their taste and skill, baby rabbits, fledgling robins, moles, young ground squirrels and chicks. On the few rare occasions that one of these mighty hunters stumbled over a half-grown mouse or rat whose ancestors had grown old and gray and well fed in the shelter of the foundry, Jerry beamed with pride—honest, legitimate pride—for days and days.

Approximately every six weeks and irrespective of the weather and the state of the Nation, spring, summer, autumn and winter, the foundry office was converted into a cat maternity ward. For about 16 days the dear little mother surrounded by a hungry progeny, calmly supplied meals at all hours, and at the same time attended to the new arrivals' toilet by skillful application of a pink tongue to the entire area from the little quivering nose to the pointed tip of the little short tail.

With the appearance of the first full moon above the flat Kansas horizon, she realized this lazy basking period in Jerry's pride was over. Compelling primitive instinct sent her out at night in search of food, romance and high adventure. Subsequent

events indicated that invariably she found all three.

Kittens took advantage of her absence by tumbling and rolling out of their box, and then tumbling and roaming all over the office floor. Jerry, the dear old humane cat lover, placed boards on edge at the open door to keep the little cuties from getting mixed up with the sand cutter and other hazards, including men with heavy feet and none of the milk of human kindness in their systems. In my well considered opinion, based on long practical experience, there is nothing so startling as stepping over a board and having the foot come down on a soft little snarling fury all teeth and claws. With the office floor practically covered with cats and kittens of all ages and sizes, at every hour of the day and night, it was simply a physical impossibility to step over the door board without landing on one or two or three.

Eventually the time came when the boards no longer confined the kittens to the office. They laid in wait for each other beside the molds and pounced with glee when another kitten came within reach. A battle royal with neither numbers nor holds barred took them through every open mold in the shop. One little burned pill developed the nasty habit of walking over a floor of squeezer molds and dipping his paw arm length into each sprue, presumably seeking hidden treasure. With positively fiendish ingenuity and skill he ducked a barrage of core butts and grew up into an arrogant, disdainful independent blackguard. We now refer to him as the gladiator who lost the right of way argument with a lift truck.

I am willing to admit that foundry cats may present an interesting problem to some people. They can have 'em. They have caused me embarrassment, extra work, mental and physical anguish. I I—don't—like—CATS!

Steel Founders' Society Sponsors Safety Contest

Steel Founders' Society of America, Cleveland, is sponsoring its national safety contest during June, July, and August. Rules of the American Standards Association will be used to determine lost-time injury rates for participating foundries. Awards will be based on statistical results of monthly reports filed with the society under rules and procedures formulated by its national safety committee. Frequency rates developed from the monthly reports will provide the basis on which national contest winners are to be determined.

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METAL MELTING FURNACES

FOR

BRASS—ALUMINUM—MAGNESIUM

AND ALL OTHER NON-FERROUS METALS AND ALLOYS

GAS OR OIL FUELS

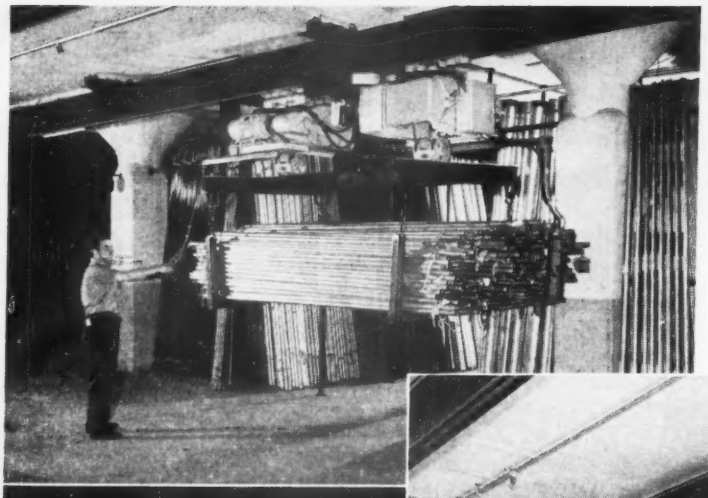
TILTING AND NON-TILTING TYPES

SINGLE AND MULTIPLE BURNERS

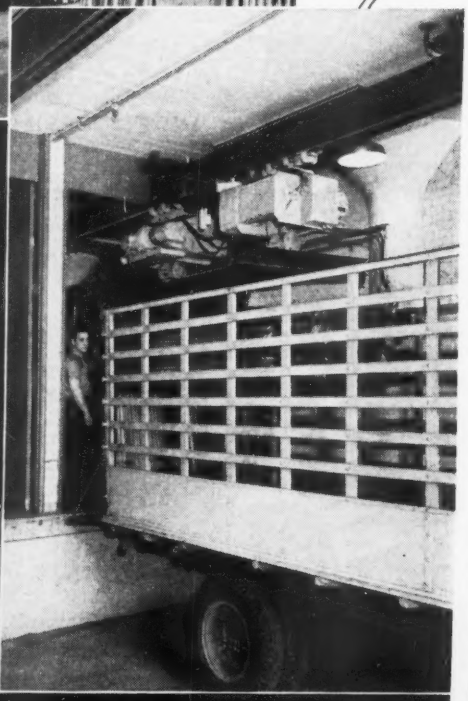
AUTOMATIC PROPORTIONING SINGLE VALVE CONTROL ASSURES UNIFORM RESULTS WITH MAXIMUM ECONOMY OF OPERATION.

The Campbell-Hausfeld Co.

300-320 MOORE ST. HARRISON, OHIO



Two hoists connected with an American Mono-Tractor make up the special carrier for finger-tip transfer of heavy load.



Carrier runs on shielded RailMaster track over loading dock.

Finger-Tip Handling *Speeds Delivery* TO GraybaR CUSTOMERS

From warehouse stock to delivery truck, heavy loads are quickly transferred by finger-tip control with this American MonoRail Overhead Handling System.

In addition to speeding up loading and unloading time, this simple inexpensive system cut handling labor, improved space utilization, reduced material damage, and bettered working conditions.

It can be done in your plant and an American MonoRail engineer will gladly tell you how.

THE AMERICAN MONORAIL COMPANY

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..TRADE PUBLICATIONS..

For More Details Use Reply Card—Page 225

SHELL MOLDING: Bakelite Co. Division of Union Carbide & Carbon Corp., 30 East 42nd St., New York 17—Booklet reviews fundamentals of the shell molding process, describes some of the variations that have been devised, and explains and illustrates methods used in the company's development laboratories. A section deals with production of hollow shell cores, and a method of making cores is outlined.

For More Details Circle No. 90—Page 225

GEAR MOTORS: General Electric Co., Schenectady 5, N. Y.—Bulletin GEA-5678, dealing with fractional horsepower gear motors, contains descriptions, cut-away drawings, selection charts, and dimension tables for both concentric shaft and right angle shaft gear motors. It includes a section on maintenance pointers and outlines a method of determining correct horsepower requirements with a pipe wrench and fish scale.

For More Details Circle No. 91—Page 225

REFRACTORIES: Johns-Manville, 22 East 40th St., New York 16—Brochure entitled "Hydraulic Setting Refractories" presents five different products for casting special refractory shapes and three products for gunning and slap troweling applications. These are hydraulic-setting refractories for services through 3000° F. Suggestions for solving maintenance problems and for casting shapes and linings are included.

For More Details Circle No. 92—Page 225

FLOOR RESURFACER: Flash-Stone Co., 30 East Rittenhouse St., Philadelphia 44—Bulletin describes floor patching and resurfacing material composed of pulverized natural rubber, asphalt-rock limestone, and cold asphalt emulsion. It is said to have good resiliency in subfreezing weather, provide good traction when wet, and resist tendency to rut or wave.

For More Details Circle No. 93—Page 225

WELDING CHART: American Manganese Steel Division, Chicago Heights, Ill.—Wall chart details the proper hardfacing rod for various welding jobs. It divides welding into basic operations, under which are listed the equipment parts to be welded, together with the recommended rod, available sizes and preferred method of application.

For More Details Circle No. 94—Page 225

PRECISION INSTRUMENTS: F. W. Dwyer Mfg. Co., 317 South Western Ave., Chicago 12—Catalog features slack tube manometers, magnehelic gages, visible float air filter gages, hook gages and smoke gages engineered for utmost sensitivity and accuracy. These are new additions to the company's line of portable and stationary gages for measuring posi-

(*Continued on page* 262)

WESTOVER ENGINEERS

3110 W. Fond du Lac Ave.
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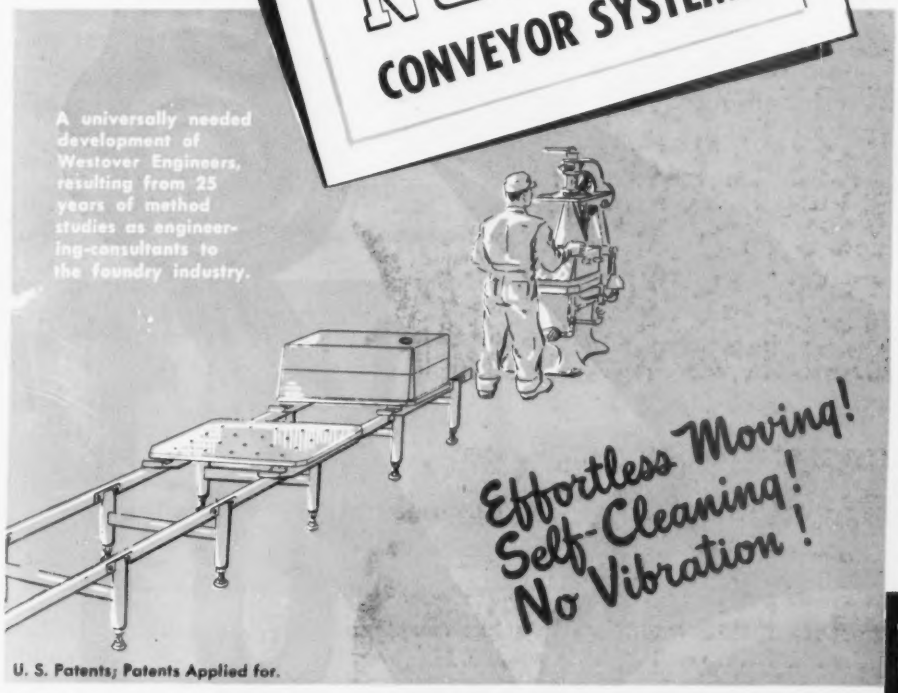
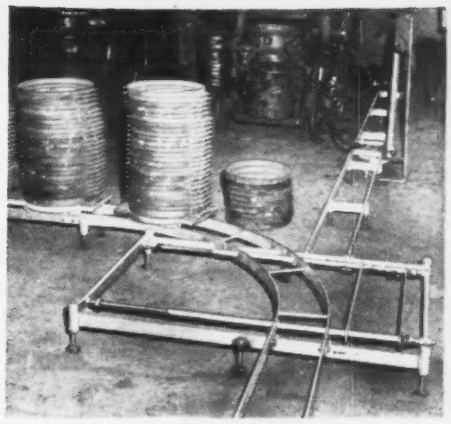
OFFER THE

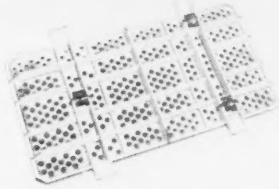
Revolutionary

NOMAD
CONVEYOR SYSTEMS


A universally needed development of Westover Engineers, resulting from 25 years of method studies as engineering-consultants to the foundry industry.
Effortless Moving!
Self-Cleaning!
No Vibration!

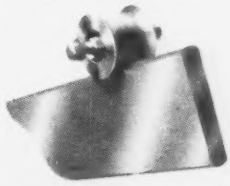
U. S. Patents; Patents Applied for.





RIGID ALUMINUM BOTTOM BOARD

Deep seated bottom board rollers, shielded from sand and molten metal, eliminate vibration and sudden shifts often caused by sticking conveyor rollers.



BOTTOM BOARD ROLLER ON RAIL

Special rounded rail edge is automatically cleaned by smooth passage of non-lubricated ball bearing rollers. Bar construction eliminates horizontal dirt collecting surfaces.

Nomad flexibility brings new efficiency to any foundry layout!

This entirely new foundry conveyor system is "based on a principle as logical as mounting a boxcar on wheels." Basically as simple as that, its flexibility permits easy adaptation to any foundry layout. Numerous specially engineered NOMAD systems have been installed involving the use of curves, switches, transfer cars, and sloped sections. Whatever the space and mobility problem, NOMAD conveyor facilities can be assembled in a wide variety of combinations to bring new and profit-making foundry efficiency.

NOMAD Foundry Equipment engineers are available to assist in laying out the equipment for you to make the most efficient use of your facilities . . . to bring to your operation increased production through reduction in lost molds, lower maintenance costs and an overall substantial saving in time and manpower.

THESE ARE NOMAD'S REVOLUTIONARY FEATURES:

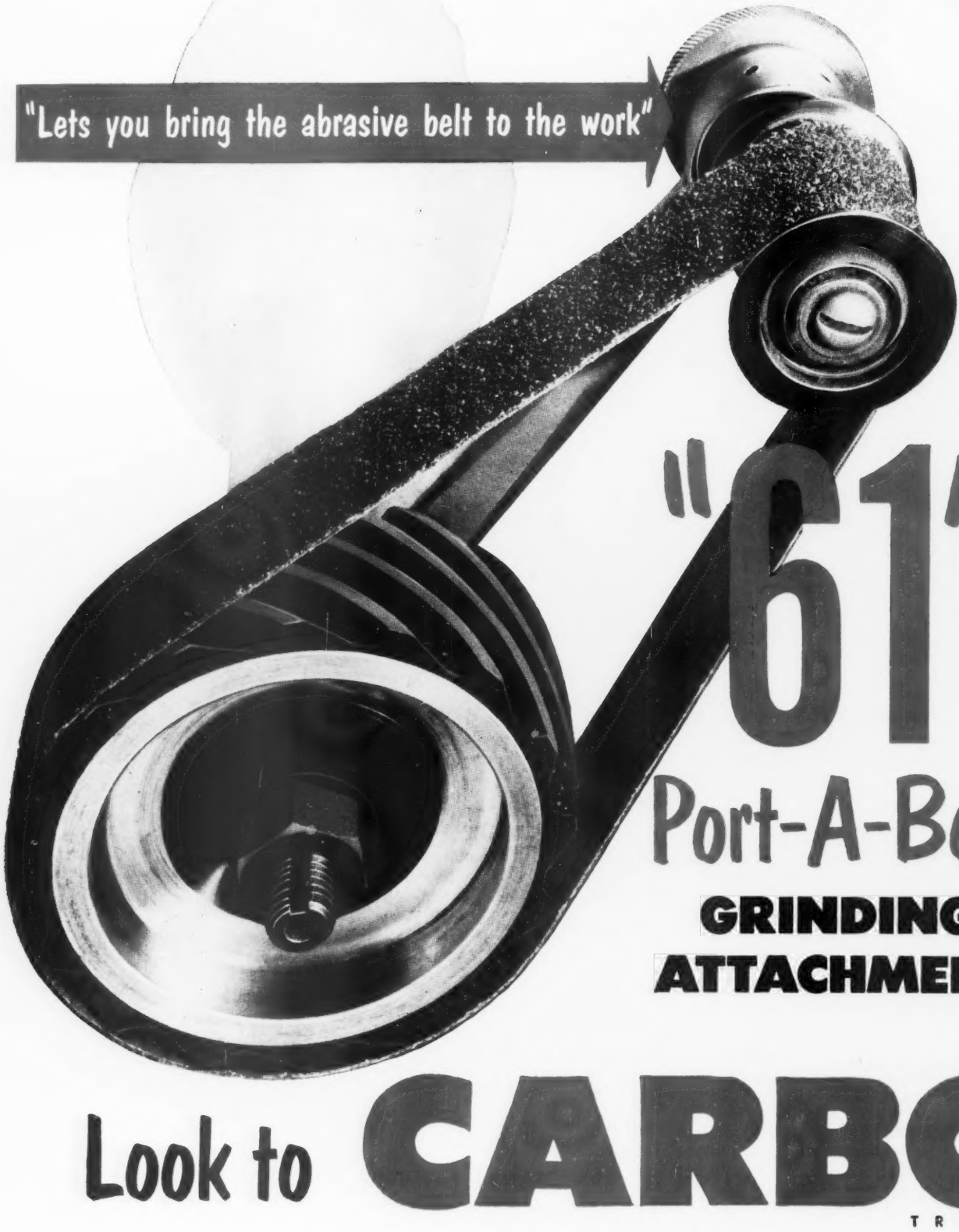
1. **No Vibration during Travel:** Bottom board location of rollers and smooth, level track, guarantee against vibration.
2. **Effortless Moving:** Twin rows of ball bearings in the rollers permit moving with minimum friction.
3. **Self Cleaning:** Entire assembly is constructed to shed sand accumulation. Top rail is self-cleaning.
4. **Low Maintenance Cost:** Non-lubricating bearing eliminates greasing and oiling. Cleaning time minimized by self-cleaning open construction.
5. **Low Initial Cost:** Case histories show offset of initial cost in only three months.

PARTS

ROLLERS, TRACK, BOTTOM BOARDS, STANDS, PALLETS AND SWITCHES CAN BE PURCHASED FOR ASSEMBLY IN YOUR PLANT—OR—WE WILL DESIGN AND BUILD THE EQUIPMENT TO YOUR REQUIREMENTS AND INSTALL IT FOR YOU. PARTS LIST AND PRICES FURNISHED ON REQUEST.

Another terrific

"Lets you bring the abrasive belt to the work"



"61"

Port-A-Belt

GRINDING ATTACHMENT

Look to CARBO

TRADE

"Carborundum" and "Port-A-Belt" are trademarks of The Carborundum Company, Niagara Falls, New York

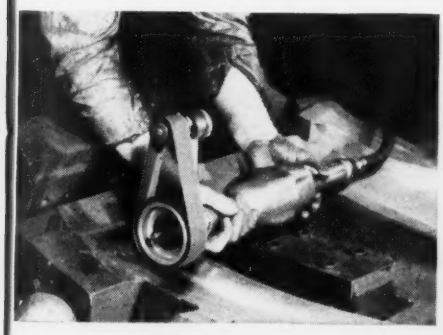
...cost-cutting development

from CARBORUNDUM

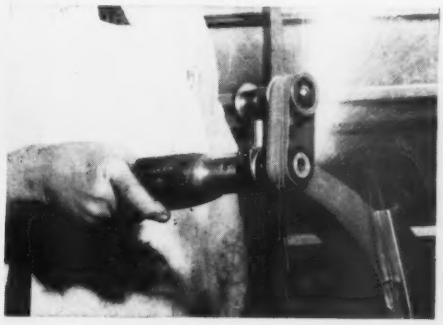
OUTSTANDING FEATURES

- No bounce—no chatter—easy to handle.
- Uses revolutionary "61" wheel principle—belts grind faster, last twice as long.
- Fits practically all standard-make horizontal portable grinders—electric or air. Easy to attach.
- Ideal in close quarters—replaces two or three conventional finishing operations.
- Worn belts snap off—new belts snap on—in a jiffy.
- Two handy, compact models—No. 400-200 (illustrated) takes 20″ x 2″ belt... No. 200-100 takes 12″ x 1″ belt.

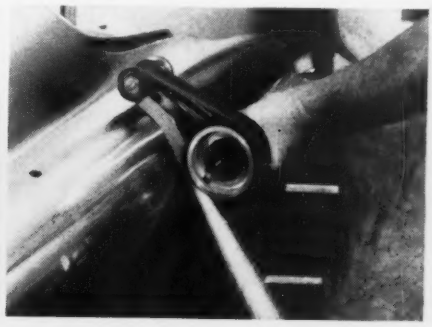
OUTSTANDING USES



- Roughing, finishing and polishing dies and molds.



- Breaking edges—saves 60% of time you now spend with cones, hand files or sander discs.



- Surface finishing of contours—concave, convex or irregular—free from lap or gouge marks.

- Reducing welds—one operation now replaces triple use of cup wheel, sander disc and set-up wheel.

Get the details!

THE CARBORUNDUM COMPANY, Dept. F 82-71
Niagara Falls, New York

Tell me more about your new PORT-A-BELT Grinding Attachment.

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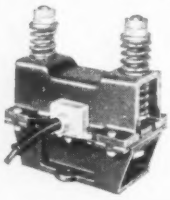
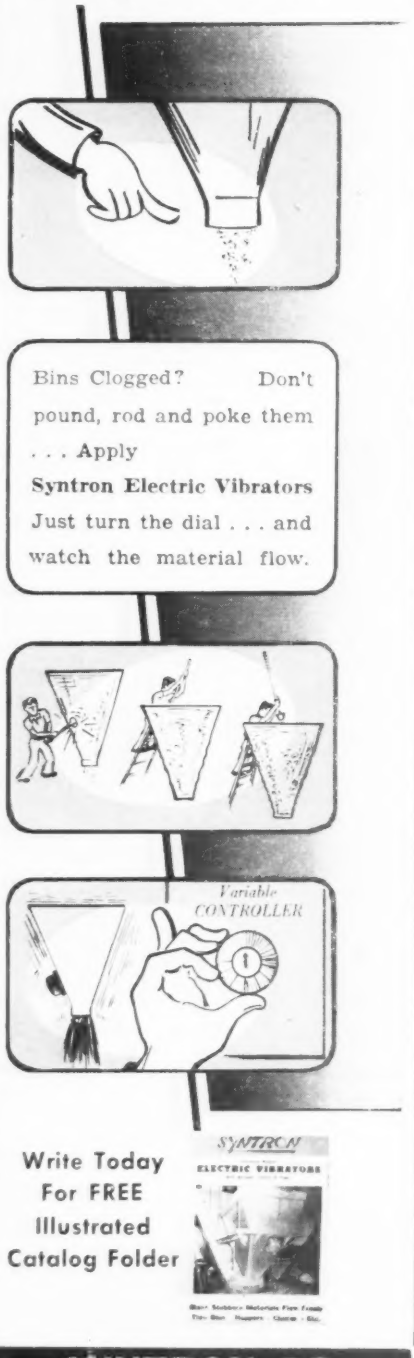
"Pulsating Magnet"

Electric Vibrators

The Way to Assure Free-Flowing Hoppers, Bins and Chutes

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Just turn the dial . . . and watch the material flow.
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SYNTRON CO.
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(*Continued from page* 258)

tive or differential pressure, vacuum, velocity, flow or temperature of gases in laboratory, factory or field work.

For More Details Circle No. 95—Page 225

BANDMACHINING: DoAll Co., 254 North Laurel Ave., Des Plaines, Ill.—Brochure 49-201, covering hydraulically operated bandtooled machine, explains bandmachining, describes features of the machine, and illustrates its use on diverse industrial applications. Bandtools and attachments for the unit are illustrated and described.

For More Details Circle No. 96—Page 225

TEMPERATURE CONTROLS: Fenwal Inc., Ashland, Mass.—Catalog 400 on temperature controls describes the design, operating characteristics and installation of each of the ten variations of the company's basic thermostatic device. Typical applications of each model are described and illustrated.

For More Details Circle No. 97—Page 225

SILICONE: Dow Corning Corp., Midland, Mich.—Illustrated booklet describes in layman's terms what a silicone is. Sections deal with silicone polishes, water repellents, fluids, release agents, lubricants, defoamers, protective coatings, rubber and electrical insulation.

For More Details Circle No. 98—Page 225

STORAGE RACKS: Barrett-Cravens Co., 4609 South Western Blvd., Chicago 9—Illustrated bulletin 5221 describes steel storage racks for drums, barrels, crates, bins, skids, and pallets. It tells how storage rack systems can increase floor space without increasing building size.

For More Details Circle No. 99—Page 225

ALLOY PARTS: Haynes Stellite Co., Division of Union Carbide & Carbon Corp., P. O. Box 746, Kokomo, Ind.—Illustrated booklet describes a variety of cast and wrought alloy parts used in many industries to solve abrasion, corrosion and high-temperature problems.

For More Details Circle No. 100—Page 225

MATERIALS HANDLING: Towmotor Corp., 1226 East 152nd St., Cleveland 10—Vol. 10, No. 1 of *Handling Materials Illustrated* tells how a foundry obtained an overall 60 per cent reduction in handling costs with a fleet of ten company fork lift trucks and attachments.

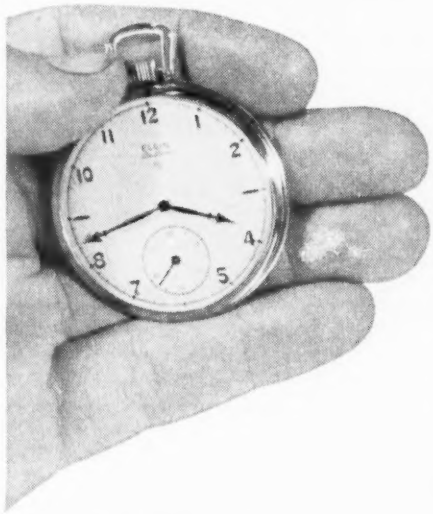
For More Details Circle No. 101—Page 225

CANVAS BELTS: C. R. Daniels Inc., Belting Division, 4900 Wetheredsville Rd., Baltimore 18—Catalog covers all phases of stitched canvas belt production. A technical data sheet gives information for ordering, installing, operation, and maintenance of canvas belts.

For More Details Circle No. 102—Page 225

PLASTER MOLD CASTINGS: Atlantic Casting & Engineering Corp., 721 Bloomfield Ave., Clifton, N. J.—"High Quality Precision Castings for Industry" contains a short history of

$2½ MILLION Worth of Castings Every Hour!



THINGS ARE HAPPENING IN THE FOUNDRY INDUSTRY

That's what the dynamic foundry industry produced in record-breaking 1951! With a whopping total of 19,000,000 tons of production valued at better than five billion dollars, America's foundries topped every previous record . . . including the peak production war years.

Things are happening in the foundry market. Foundries are spending over one million dollars every hour for materials and supplies . . . and two million dollars every week in capital investments.

That's why alert management men are giving special attention to this mass production industry. It pays rich dividends to the companies that recognize foundries as a separate market well worth going after with an independent and intensive sales effort.

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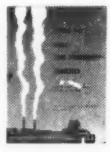

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A Penton Publication
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Cleveland 13, Ohio

the company, explains how the company's plaster mold casting process affects savings in material, grinding, machining and other operations, and makes possible the production of parts which could not be accomplished economically by any other means.

For More Details Circle No. 103—Page 225

ROOF COATING: Paramount Industrial Products Co., University Center Station, Cleveland 6—Bulletin L-5201 covers an asphalt and asbestos roof coating which is said to always remain soft and pliable, and contract and expand with temperature changes.

For More Details Circle No. 104—Page 225

HOT TOPPING: United States Graphite Co., 1621 Holland St., Saginaw, Mich.—Folder describes hot topping compound for casting risers and ingot heads. It is intended to provide efficient feeding by the hot top or riser to the casting cavity, giving maximum metal yield.

For More Details Circle No. 105—Page 225

EQUIPMENT: Jeffrey Mfg. Co., 907 North Fourth St., Columbus 16, O.—Catalog 845 illustrates and describes company's varied foundry equipment. Specifications and dimension drawings are included for most items.

For More Details Circle No. 106—Page 225

SAND MIXERS: National Engineering Co., 549 West Washington St., Chicago 6—Illustrated bulletin 503 describes redesigned attachments and assemblies which can be installed on existing company mixers to rehabilitate and modernize them.

For More Details Circle No. 107—Page 225

INSPECTION: Magnaflux Corp., 5900 Northwest Highway, Chicago 31—Folders 497-L and 497-F describe laboratory inspection facilities and field inspection service offered to foundries for nondestructive testing of castings.

For More Details Circle No. 108—Page 225

PATTERN COATING: McDougall-Butler Co., Buffalo 5—Folder describes a pattern coating for protecting patterns from oils, water, waxes, kerosene and gasoline. Coating also is said to reduce warping, swelling, wear and deterioration.

For More Details Circle No. 109—Page 225

LIGHTING: Sylvania Electric Products Inc., 60 Boston St., Salem, Mass.—Bulletin on industrial lighting outlines an eight-step program of planned fluorescent lighting maintenance.

For More Details Circle No. 110—Page 225

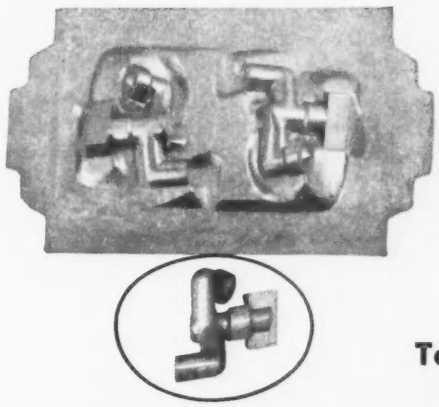
SAND RECLAMATION: Denver Equipment Co., 1400 Seventeenth St., Denver 17—Bulletin M7-F8 describes equipment for reclaiming foundry sand for reuse. Operation of the system is discussed in detail.

For More Details Circle No. 111—Page 225

X-RAY EQUIPMENT: Picker X-Ray Corp., 25 South Broadway, White Plains, N. Y.—Catalog illustrates and describes industrial x-ray accessory equipment.

For More Details Circle No. 112—Page 225

MORE CASTINGS AT LESS COST
with PRESSURE-CAST ALUMINUM
MATCHPLATES and COPE & DRAG PLATES



Only one master pattern does it! From it we make you single- or multiple-pattern aluminum matchplates, casting them under pressure in plaster molds. We also make cope & drag plates of aluminum. Send us your pattern and we will give you a quotation without delay.

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Toledo Matchplate Company
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Affiliate: Plaster Process Castings Co.,
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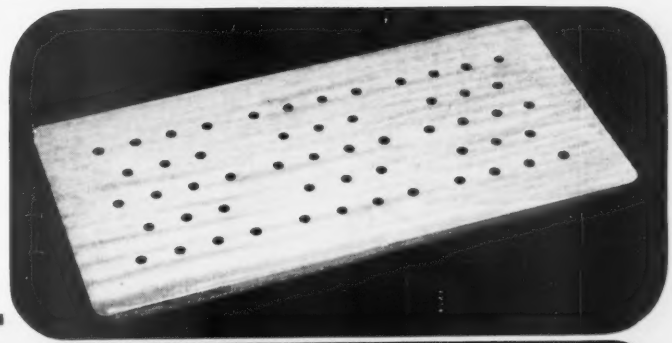
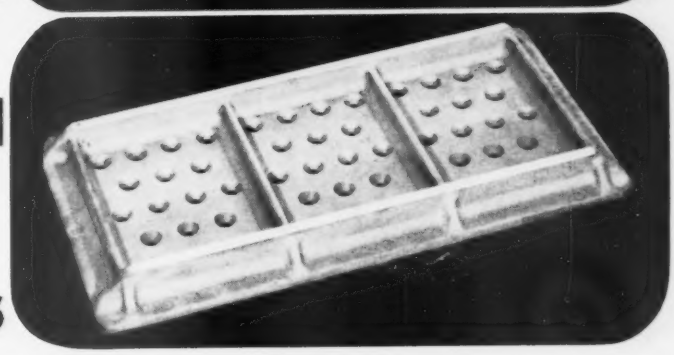
PRESSURE-CAST MATCHPLATES
COPE & DRAG PLATES





MAGNESIUM CORE PLATES

AM-MAG Lo-Heat core plates handle easier in production, clean faster and reduce the core oven load since they absorb much less heat than other plates. Core makers like AM-MAG core plates because of their light weight. They stack easily, facilitate maximum core blower production. Oven tenders, too, find them ideal in handling. Machined surface reduces core scrap.

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2970 WEST GRAND BLVD., DETROIT 2, MICHIGAN

For *Thorough* MIXING–*Economically*–it's the

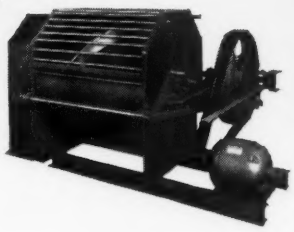
KENT CONTINUOUS MIXER

As it applies to sand mixing the accelerated demand for more efficient methods in foundries is being met most satisfactorily with

KENT Continuous MIXERS

The principle on which they operate has been proved for over 26 years. Two or more ingredients can be mixed. The *slicing, turning, shoveling* action is adjustable to an infinite variety of requirements. And, once set no further adjustments are necessary.

Material is received *continuously,* mixed *continuously* and delivered *continuously.* The operator SETS the machine—STARTS it and LEAVES it—to devote his efforts to other work.



Let us discuss KENT mixing in relation to your particular needs.

★ ★ ★

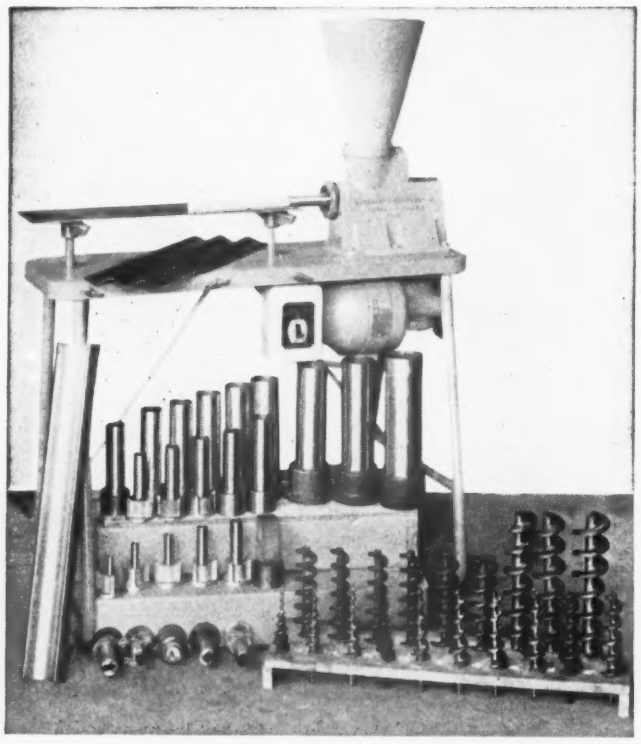
KENT Batch MIXERS are also available in several sizes and capacities.

Write for literature if interested in this type of equipment.

The KENT MACHINE CO. Cuyahoga Falls, Ohio

MIXER MANUFACTURERS SINCE 1925

STOCK CORE EXTRUDERS



Wadsworth #1 Capacity 3/8" to 3"

By: **WADSWORTH EQUIPMENT CO.**

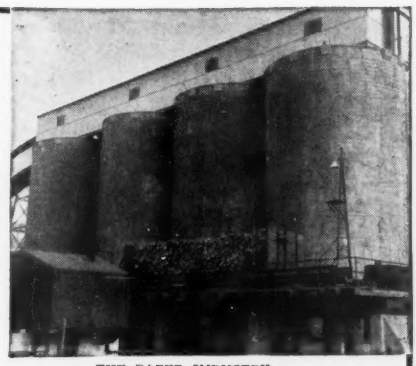
555 La Follette St., Akron 1, Ohio

87

varieties

•

stored in N & F silos



THE PAPER INDUSTRY

The photo shows four 30 x 60 ft. Neff & Fry silos used for storing wood chip at a pulp and paper plant. Each holds 30,000 cu. ft. of chips, enough to make 80 tons of pulp, which is 16% of the daily run.

Wood chips are one of the 87 kinds of flowable bulk materials handled in Neff & Fry Storage Bins. The list includes ashes, cement, clay, coal, grain, gravel, lime, nuts, ore, rock, sand, seed.

The distinctive feature of a Neff & Fry Bin is the diagonal-ended Super-Concrete Stave . . . formed under 140 tons pressure . . . . virtually as dense, strong, and enduring as natural stone. The stave does not rot, rust, burn, or spall.

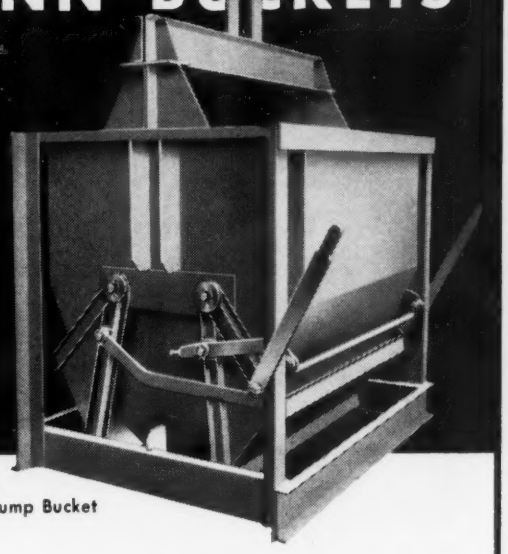
Get the whole story in our folder, "Bins With the Strength of Pillars." Ask for it now while you have the subject in mind.

Not exported except to Canada and Mexico

THE NEFF & FRY CO. • 214 Elm St., Camden, Ohio

SUPER-CONCRETE STAVE STORAGE BINS — NEFF & FRY

PENN BUCKETS



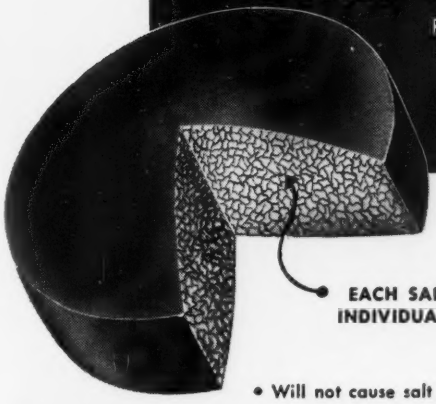
No. 30-A
Bottom Dump Bucket

Exclusive design makes this bottom dump bucket easy to operate . . . easy to open. Efficient for foundry use in handling all types of sand, moulding or core, dry or prepared. Can be used with coke, scrap iron and castings also. Sizes 7 to 200 cu. ft.

Write Today for Catalog • Prices Quoted on Application

PENN IRON WORKS, INC.
READING, PENNA.

New **PEP-UP** IMPREGNATED
SALT TABLETS
RELEASE SALT IMMEDIATELY
(Not Enteric Coated)

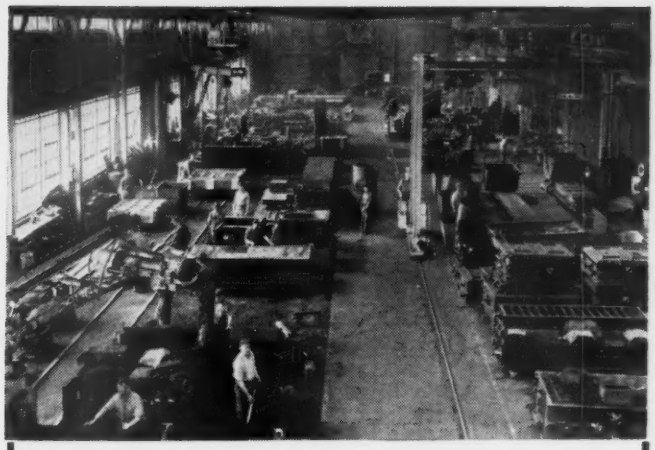


EACH SALT CRYSTAL INDIVIDUALLY COATED

- Will not cause salt sickness or nausea
- No delay in getting salt into system
- Starts dissolving immediately
- Dissolves completely in about 100 minutes
- Withstands rough handling and storage without deterioration
- Meets Government Specification No. SS-S-31 D
- Order Now—Be Prepared
- Write for literature and prices

DISPENSER
PEP-UP Impregnated Salt Tablets come to you in sanitary, factory-sealed dispensers at no extra cost.

UNITED STATES SAFETY SERVICE CO.
KANSAS CITY 6, MISSOURI BRANCHES IN PRINCIPAL INDUSTRIAL CITIES
In Canada: PARMELEE, LTD. Toronto



STOP DUST ECONOMICALLY

The Johnson-March Dust Control System provides positive dust control at a cost averaging less than 1/10 of other systems.

Hundreds of installations are daily eliminating dust in various foundry operations. Unlike other dust control systems, the J-M System *eliminates dust at the source,* not after it has become airborne.

In foundries, the J-M System eliminates dust from:

FLOORS and WALKS—Prevents rising of dust from dirt floors and sand heaps.

SAND CONDITIONING OPERATIONS—Stops dust at the machines, prevents it from becoming airborne.

SHAKE-OUTS—Effectively controls dust on all types of shake-outs. Can be used independently or in conjunction with exhaust systems.

CUPOLA STACKS—Stops air pollution by washing the gases.

CLEANING CASTINGS—Stops dust during grinding or chipping operations and when cores are removed from castings.

Johnson-March engineers will be glad to discuss your dust problems at no obligation. Write today for details.

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Specialists in Dust Control
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"We need a FREE MACHINING METAL
Let's use FRONTIER 40-E
Aluminum Alloy...

. . . it's a combination of
HIGH YIELD STRENGTH
RESISTANCE TO SHOCK
and REQUIRES NO HEAT TREATMENT!"

Jim: Say, that sounds like an alloy that ought to do the trick. The production jobs we've got require lapping and close tolerance machining operation.

J. D.: FRONTIER 40-E will do just that! There's no tearing effect of cutting tools and we can be sure of getting a smoothly finished surface.

Jim: I know it can be readily reamed or tapped. But what about pressure tightness and corrosion resistance?

J. D.: Castings of ½" to 1" wall thicknesses withstood pressures up to *400 pounds per square inch* with no evidence of porosity or cracking. Corrosion resistance is excellent, even under stress.

Jim: I've seen truck axles, stress parts in planes and lots of other applications where FRONTIER 40-E was used with substantial weight reductions . . . and yet all-important product strength was *increased.*

J. D.: You can't beat FRONTIER 40-E castings for the important physical properties needed in applications throughout every industry. Better get on the phone and order our FRONTIER 40-E right away, Jim.

WRITE for your copy of the FREE ALLOY DATA book that will give you the full story on how 40-E can work with profit—for you.

Remember — if aluminum can do it *better* — FRONTIER 40-E Aluminum Alloy can do it *best!*

FRONTIER
BRONZE CORPORATION
4878 Packard Road, Niagara Falls, N. Y.

No. 4 DAYTON RING VALVE
BENCH
RAMMER

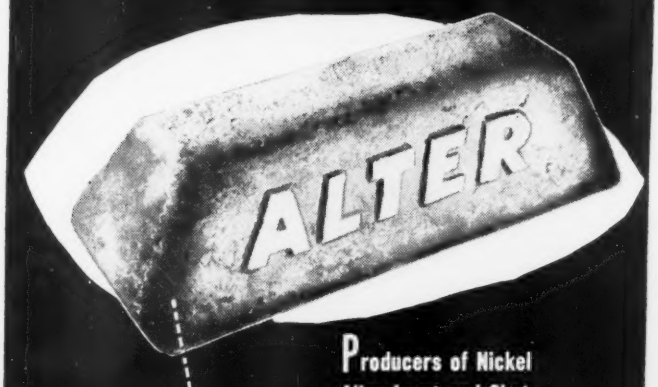
MORE POWER—MORE SPEED

You'll get more production with these faster, more powerful rammers and at the same time substantially reduce maintenance costs.

The Valve Units will last for years. The Cylinder Bores and Piston Rods are HARD CHROME PLATED which doubles the life of the Rammer. Many of the largest foundries in the country have already adopted them as standard. Made in six sizes to meet every requirement.

Send for Bulletin 300

DAYTON PNEUMATIC TOOL CO.
Manufacturers of Pneumatic Tools Since 1903
DAYTON, OHIO



Producers of Nickel Alloy Ingot and Shot. Cupro Nickel Shot and pure Copper Shot. Special Metallurgy to suit our customers needs as well as standard Master Alloys. Highest standards of Metallurgical Control.

Over 50 Years
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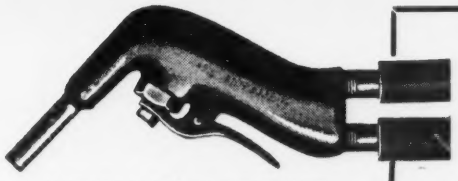
Eliminate—SWABS . . BRUSHES SPRAY CANS with the MURPHY PISTOL SPRAYER



OVER A MILLION SOLD TO DATE

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HAMILTON SPRAY GUN

Complete with 4½ ft. suction hose and sinker . . . **$10.00 F.O.B.** Hamilton, O. *For spraying molds and cores with any liquid. For cleaning motors and machinery. For laying dust. Trigger control. Well made and guaranteed.*

The MURPHY PISTOL SPRAYER shoots blackening into hidden pockets beyond the reach of swabs. Jobs are completed faster and castings peel better and come cleaner. It is of great value in cleaning permanent molds, for aluminum and other metals as well as for sand blasting. For silica wash, oil, water or any liquid material and as a blow gun for cleaning parts and machinery. We guarantee this sprayer, designed by a practical foundryman . . . Write today!

PRICES COMPLETE WITH SUCTION HOSE AND SINKER

PIPE SIZE	1/16"	1/8"	1/4"	3/8"	1/2"
PRICE F. O. B. HAMILTON, O.	$12.00	$12.00	$12.00	$14.50	$18.00

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AFTERCOOLERS • SEPARATORS • STRAINERS • TRAPS
SPRAY GUNS • PISTOL SPRAYERS

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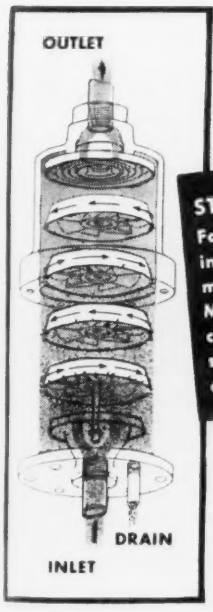
Moisture Elimination Up To 3000 Pounds Per Square Inch

Why does an ARIDIFIER

REMOVE 92% OIL, WATER AND DIRT FROM GAS AND AIR LINES?



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Four multi blade rotors revolve at high speed in opposite directions under impact of air movement through non-aligned rotor spaces. Moisture, dirt and other foreign matter which collect on rotor blades are thrown out of air stream by centrifugal force to side of housing, and pass into drain.

For paint and lacquer spraying, ceramic, sand blasting, air cleaning, etc. Easily replaces less efficient baffle type devices. Tell us details of your problem when you write for a catalog.

CAPACITY RANGE: AS LOW AS 7 CFM TO 17,000 CFM.

Made By The Manufacturers of Logan Lathes and Shapers.

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Where a Hole Counts

The Open Head of the Cleveland Coil Head Radiator Chaplet makes it easy to pack sand solidly under head and around the stem. This ensures better support for the chaplet, more rigidly held cores — reduced castings rejects.

• SAND PACKS BETTER

Patented

WRITE FOR BULLETIN showing our line of Coil Head and Square Head Radiator Chaplets, also Motor, Boiler, Forged Head, Fitted Head, Double Head and other types.

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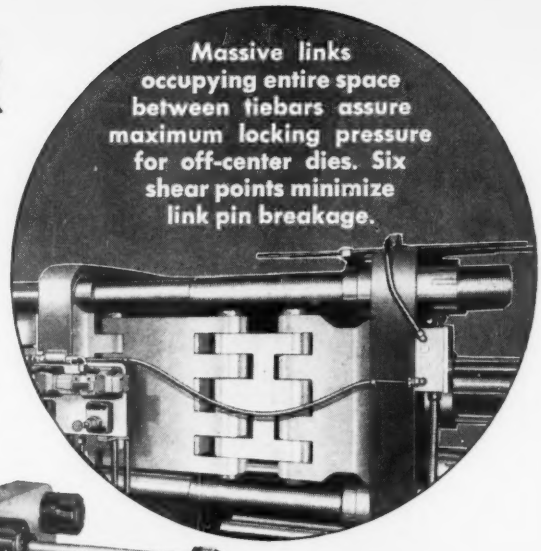
CLEVELAND Chaplets
Since 1890

CAST - MASTER

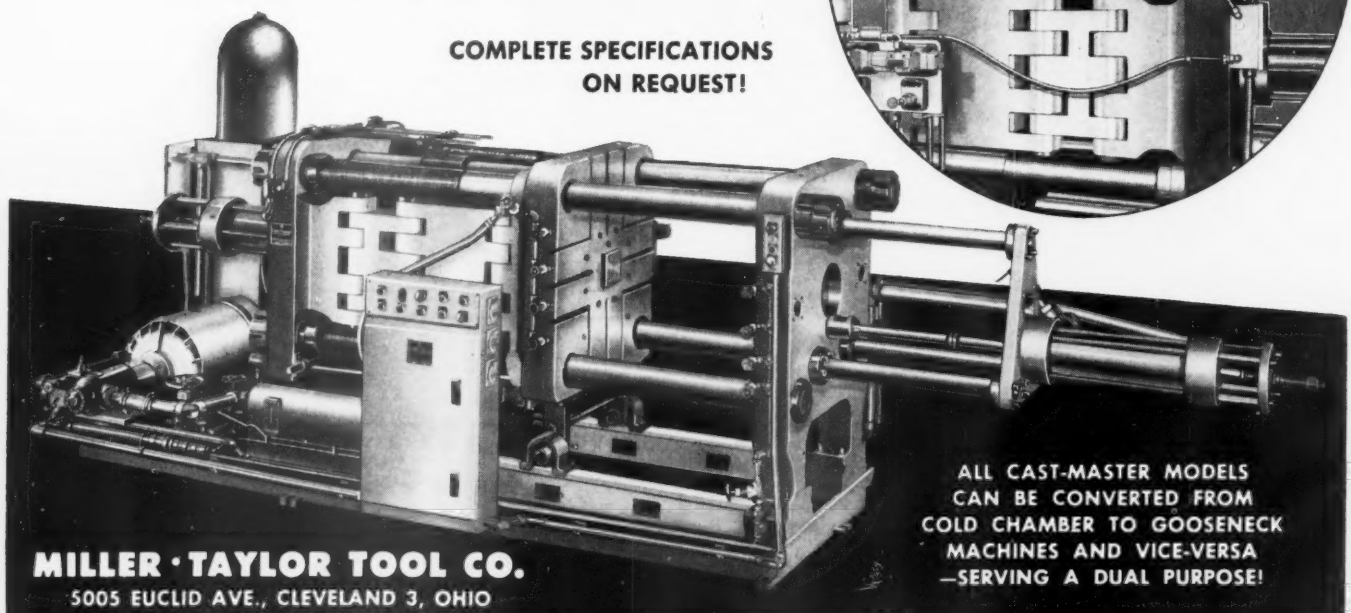
Die Casting Machines

STURDY, RIGID CONSTRUCTION ASSURES TOP EFFICIENCY, LOWER OPERATING COST!

COMPLETE SPECIFICATIONS ON REQUEST!



Massive links occupying entire space between tiebars assure maximum locking pressure for off-center dies. Six shear points minimize link pin breakage.



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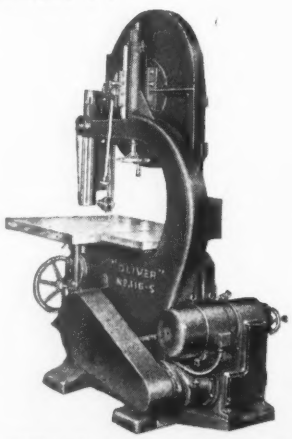
"OLIVER"

38-inch Metal Cutting

BAND SAW

Has variable low speed motor for cutting heavy cross sections . . . or high speed motor for cutting sheet metals, plastics, etc.

A powerful Band Saw—the finest built. Cuts true, steady, smooth. Large capacity under guide. Has variable low speed geared head direct connected to lower wheel for cutting light and heavy cross sections. Also furnished with high speed motor for cutting woods, compositions, sheet metals. Quick-change rim and tire. Precision built. Ask for Bulletin 115-S.



"Oliver" Metal Cutting Band Saws also made in 18", 30" and 36" sizes

OLIVER MACHINERY COMPANY

Established 1890 **GRAND RAPIDS 2, MICHIGAN**

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SPECIAL

FOUNDRY COKE

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A QUALITY PRODUCT

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Manufactured at Terre Haute, Indiana by INDIANA GAS & CHEMICAL CORPORATION

Reduce Use of Chills in Gray Iron Casting

Now all you have to do to get hard chilled iron is add

TELLURIUM

Comes in 1, 2, 3, and 4-gram tablets; also in powder, slabs and sticks. For full information, write Dept. LM for 16-page article on the use of TELLURIUM in chill control.

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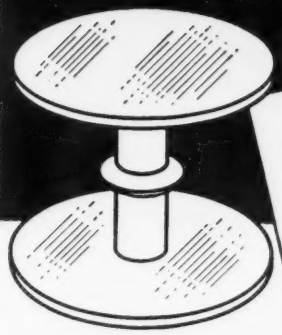
no chance for leakage here



Buffalo CHAPLETS

Exclusive fin design of both Double and Single Head types assures positive fusion with molten metal. No recess in stem to weaken structure. Leakage problem is ruled out. Burns in more easily. Does not chill molten metal.

In addition, extensive variety of other types to meet your needs exactly. Since 1912, serving the nation's leading foundries. Trial samples without charge.

Complete information in Catalog No. 16

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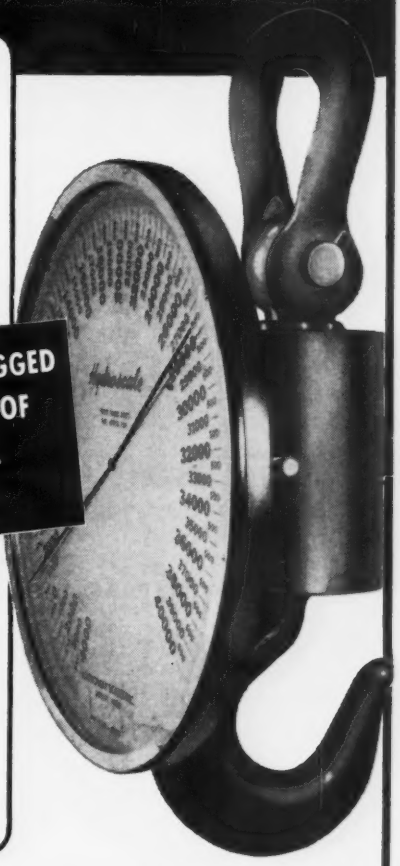
HYDROSCALE SIMPLIFIES WEIGHING!

- Weighs as you lift the load to move it.
- Eliminates weighing station tie-ups.
- Models 500 to 200,000 pounds.

A COMPACT RUGGED CRANE SCALE OF HYDRAULIC ACCURACY



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- Combination kilogram and pound dials
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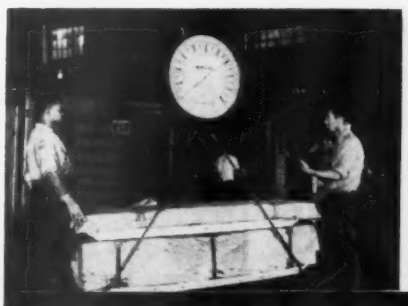
Protects you against loss by making weighing easy and effortless. Encourages careful checking of materials in and out of plant and materials in process at production stages. Repeat orders from users in all types of industry testify to its usefulness and versatility.



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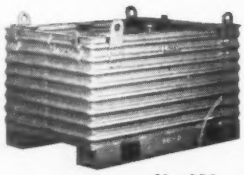
rugged BRUSCO handling equipment increases efficiency

BRUSCO CORRUGATED STEEL BOXES



No. 558

Save floor space — stack safely from floor to roof. Four way entry for fast, efficient handling. Equipped with crane lugs for movement by crane. Fabricated from heavy gauge corrugated steel to give added rigidity and maximum strength. Thoroughly and securely arc welded for longer, maintenance free life. Made in various sizes and load capacities to suit your requirements.

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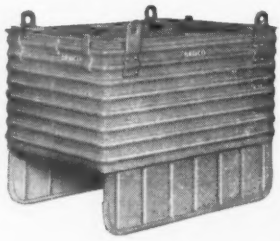
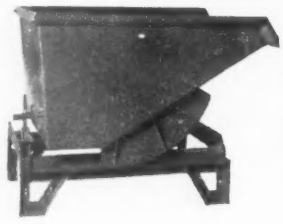


Saves valuable floor space and speeds production. Made in all sizes and various gauges of steel to fit any load capacity. Stack from floor to roof.

No. 1210 BRUSCO SELF DUMPING HOPPER



Speeds production and saves labor in handling your parts and materials. This hopper is fabricated of heavy steel plate thoroughly reinforced. Made in ½, 1, 1½ and 2 cubic yard capacities. Underclearance is optional.

Write today for new Bulletin No. 500 presenting the most complete line of Part Boxes and Brusco Self Dumping Hoppers on the market.

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A BLAST FURNACE PRODUCT

Smelted from Superior quality lake ores, high grade metallurgical coke and limestone, using our own local No. 1 Sharon Seam coal.

HIGH SILICON IRON JISCO

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- AMASTEEL is the blast cleaning material that is engineered for the job.
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Abrasive for any and all kinds of work.

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because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

ARE PREFERRED BY OPERATORS
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chipping, ramming, grinding, buffing, sanding or wire brushing, *write us today for full particulars.*

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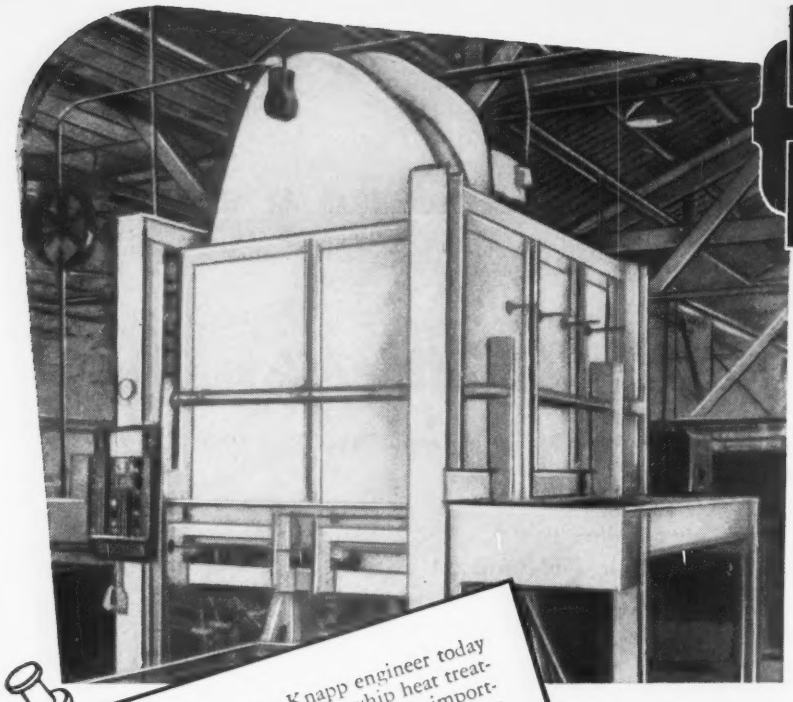

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It's easier to meet aircraft production schedules when plants are equipped with KNAPP equipment.

From long experience, Knapp engineers have learned how to design heat treating furnaces that meet every requirement of the Armed Forces... and to meet these requirements with an eye toward cost.

That's why every Knapp furnace is "engineered for economy"—the economy that spells the difference between profit and loss on difficult defense contract assignments.

Be sure—Be Safe! Call a Knapp engineer today for full information on how to whip heat treating problems in your plant. Remember, important defense contracts may pass you by if your heat processing equipment is inadequate... So, write, wire or phone today.

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INDUSTRIAL FURNACES THAT SATISFY
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SHOOT YOUR MATERIALS IN PLACE
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SAVE LABOR TIME COSTS

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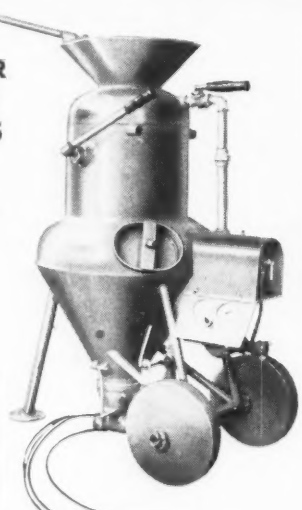

3 MODELS { SMALL MEDIUM LARGE

BLASTCRETE EQUIPMENT CO., INC.
11154 Santa Monica Blvd.
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New CANNON "QUIET-TYPE" DOUBLES VIBRATOR LIFE

Greater Vibration
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Cannon 2" Style EM "Quiet-Type", Heavy Duty Vibrator with long stroke.

● Air-cushioned impact and heavier pistons with longer strokes give Cannon "Quiet-Type" Vibrators long-lived, economical vibration. There is no metal to metal pounding. Bolt and end plate breakage are eliminated.

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For better, more dependable pneumatic vibration, try Cannon Vibrators. Available in 1¼" to 4" piston sizes, they range in weight from 9 to 140 lbs. Satisfactory performance is *guaranteed.* Send for complete information today!

A-4501

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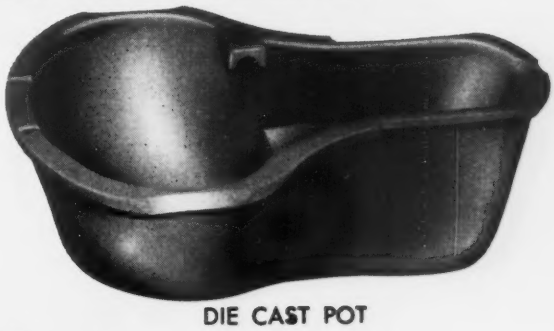
SPOUT POT
NO. 550A



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EXPERIMENTAL CENTRIFUGAL CASTING

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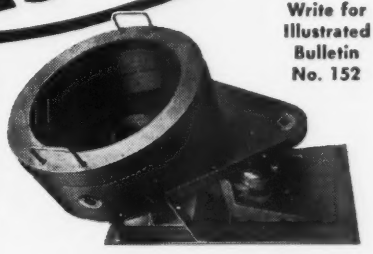

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MOLD DRYING
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3 BIG OPERATIONS WITH 1 EQUIPMENT

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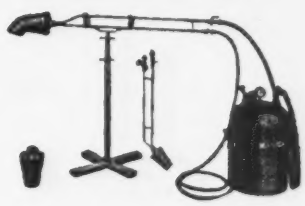

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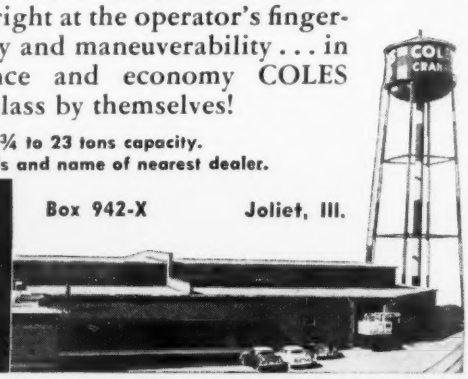

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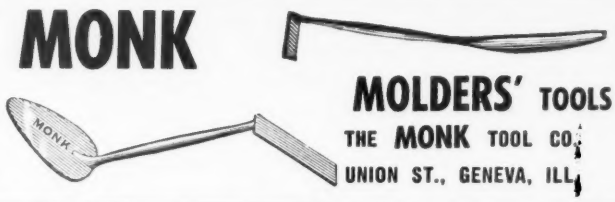

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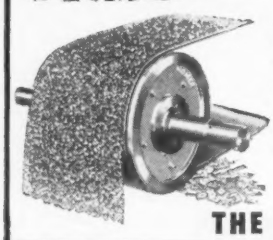

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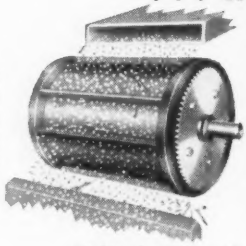

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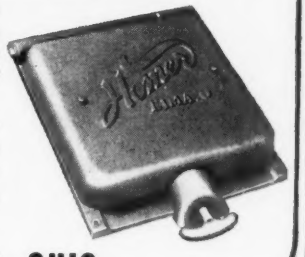

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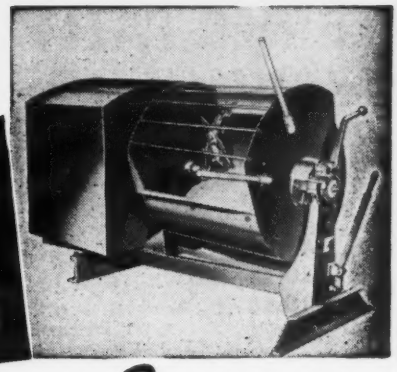

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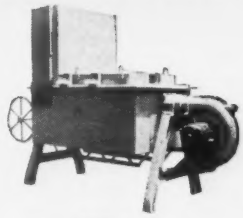
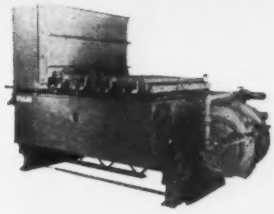


400 Series



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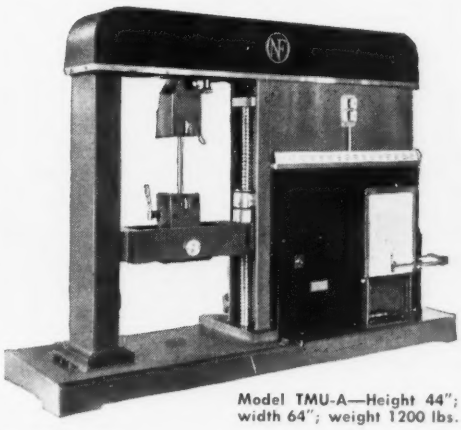

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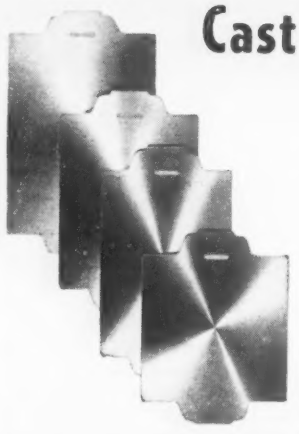

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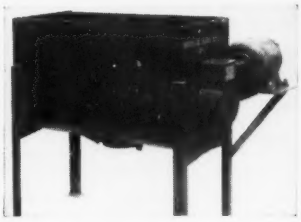

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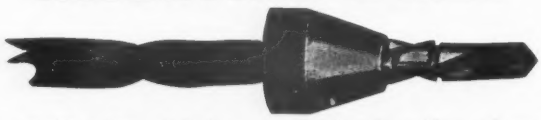

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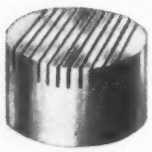

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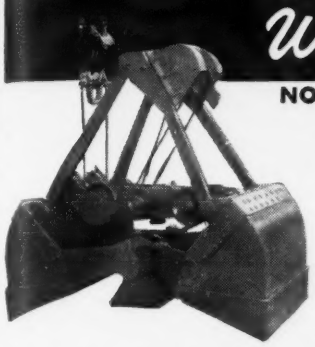

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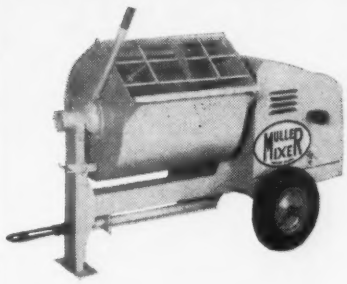

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CHIEF ENGINEER

SALARY $8000—$10,000

Permanent mold and die cast die design experience in light metals required. Man we want has a sound record behind him and has top management ambitions for the future. Bonus plan. Write in detail. Address: Box 121, FOUNDRY, Cleveland 13, Ohio.

MECHANICAL SUPERINTENDENT

Man with wide experience in foundry engineering and maintenance together with considerable administrative background needed to head up plant engineering and maintenance in an extremely large steel foundry in Chicago area. Excellent opportunity for right man to grow in large organization. Address: Box 136, FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Twenty-four years all round practical and technical experience—jobbing or production, metallurgy, sand control, aluminum, malleable, gray iron. Salary open. Age 42, married, good health. A-1 references. Address: Box 126, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY METALLURGIST

Unusual opportunity available for qualified foundry metallurgist. Interest in and knowledge of modern research methods in foundry field required. Practical foundry experience preferred. Opening calls for person able to accept responsibility in an expanding organization. Excellent possibility for personal and professional growth; good salary; pleasant working conditions.

METALS DEPARTMENT
ARMOUR RESEARCH FOUNDATION
CHICAGO 16, ILLINOIS

WELDING ENGINEER

Experienced welding engineer needed for plant in Chicago area currently engaged in production of armor castings. Man with technical and practical experience in welding steel castings particularly low alloy castings. Will have opportunity to grow in large steel casting organization. Address: Box 135, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Opportunity for well qualified man capable of taking charge of melting and annealing departments in modern foundry. Duplex melting—continuous and batch type annealing. Plant located in Illinois. Address: Box 114, FOUNDRY, Cleveland 13, Ohio.

ASSISTANT FOUNDRY FOREMAN

Experienced in modern moulding practice, for large copper company Chile, South America, whose monthly production averages over 1100 tons of castings made up of gray iron, steel and nonferrous metals. Three year contract. Transportation both ways and salary while traveling, paid by Company. Give complete details. Reply Box 885, FOUNDRY, Cleveland 13, Ohio.

SALES REPRESENTATIVE WANTED

Several territories available for full time exclusive sales of AlSiMag Foundry Ceramics. A man to sell only our Foundry Ceramics is needed in several territories because of our growth. This is an excellent opportunity with the nation's largest manufacturer of technical ceramics.

AMERICAN LAVA CORPORATION
CHATTANOOGA 5, TENNESSEE

HEADQUARTERS FOR TECHNICAL CERAMICS FOR MORE THAN 50 YEARS.

FOUNDRY SUPERINTENDENT

Thoroughly experienced man in aluminum permanent mold for modern midwest foundry. Magnesium experience helpful. Essentials are ability to handle people and maintain production schedules. Technical background helpful, not required. For a qualified man who probably has at least ten years' experience, salary is open and future unlimited. Bonus plan. Send complete resume in confidence. Address: Box 122, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

EXPERIENCED PATTERNMAKER

To work in, prepare estimates and manage completely equipped shop affiliated with Dallas' largest nonferrous foundry but doing outside work. Right man can eventually share in profits, ownership. Write stating salary required. ADDRESS: WAYLAND BOLES, 4369 POTOMAC, DALLAS 5, TEXAS.

CLEANING ROOM

Experienced man to run cleaning room in modern steel foundry in East. Excellent opportunity for man with experience and ability in plant operations and incentives. Address: Box 877, FOUNDRY, Cleveland 13, Ohio.

PATTERNMAKER

Wood jobbing shop patternmaker for Pacific Northwest. Foundry shop. Excellent working conditions. Minimum scale $2.43 per hour. Forty-hour week. Paid vacation. Steady employment for qualified man. Give full personal details and experience first letter. Address: Box 120, FOUNDRY, Cleveland 13, Ohio.

STEEL FOUNDRY METALLURGIST

Well established New Jersey foundry requires a graduate metallurgist. June graduate or one with one or two years' experience desired. Advancement based on successful applicant's ability and initiative. Very good working conditions. Address: Box 127, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY ENGINEERS AND DRAFTSMEN

Having foundry operating or plant engineering experience. Write, enclosing photograph and complete record of education and experience in detail, including previous employers and length of service. State age and salary expected. ADDRESS: LESTER B. KNIGHT & ASSOCIATES, INC., 600 W. JACKSON BLVD., CHICAGO 6, ILL.

CORE ROOM FOREMAN

Experience in steel jobbing work essential. Must be able to follow production schedules. Supervise production by machines and coreblowers all cores. Modern foundry Eastern Penna. Salary and bonus commensurate with ability. Address: Box 815, FOUNDRY, Cleveland 13, Ohio.

INDUSTRIAL ENGINEER

Specializing in foundry work. Applicant should be free to travel and understand foundry operations. Sketching and time study important. Applicant will be trained in specialized fields. In reply state qualifications, education and enclose recent photo. Address: Box 125, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Opening for Foundry Metallurgist in modern steel foundry Eastern Penna. Practical foundry background desirable but not necessary. Excellent opportunity for advancement. Address: Box 814, FOUNDRY, Cleveland 13, Ohio.

GRAY IRON METALLURGIST

Progressive company has opening for graduate metallurgist with five to ten years' experience in gray iron foundry operations. Work involves field service, control operations, foundry research and development. Unlimited opportunity for advancement. Cleveland headquarters. Address: Box 128, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

For gray iron foundry, producing heavy castings in high strength and alloyed irons. Must have thorough knowledge of cupola practice and metallurgical controls. Kindly address replies to: HAROLD LOWE, BUFLOVAK EQUIPMENT DIVISION, BLAW-KNOX COMPANY, BUFFALO, NEW YORK.

PATTERN FOREMAN

Experience in metal patterns, cope and drag. For well established Southern firm. Permanent position for right party.

BOX 161

FOUNDRY CLEVELAND 13, OHIO

Help Wanted

FOUNDRY SUPERINTENDENT

Good opportunity for young man in midwest grey iron jobbing foundry. Must be able to estimate and rig heavy castings and production work. State age, references and salary wanted. Address: Box 146, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOREMAN

For 12 molder foundry in New York City, specializing in aluminum alloy castings. One who can rig jobs and handle men for maximum production of quality castings, both jobbing and machine. Good salary and steady job for right man. Send resume. Address: Box 123, FOUNDRY, Cleveland 13, Ohio.

Representatives Wanted

REPRESENTATIVE WANTED

Foundry specializing in aircraft quality magnesium and aluminum seeks sales representation in all areas. Prefer man now selling non-conflicting lines. Please write fully. Address: Box 156, FOUNDRY, Cleveland 13, Ohio.

SALESMAN

To represent foundry supply company in Western Ohio and Indiana. Address: Box 134, FOUNDRY, Cleveland 13, Ohio.

Accounts Wanted

ACCOUNTS WANTED

Practical foundry consultant. Nonferrous, aluminum, magnesium. Thirty-five years' experience. Trouble shooting, setting up and developing new plants. Reasonable terms. Address: RAYMOND WICKLEIN, 30 MEADOWBROOK PL., MAPLEWOOD, N. J.

Positions Wanted

FOUNDRY SUPERINTENDENT

Age 43, 25 years' practical experience ferrous and nonferrous. Fully qualified to take complete charge all foundry operations. Iron by analysis, high and low carbons. General jobbing preferred. Have held supervisory positions past 15 years, last ten as superintendent. Now employed. Complete data education and experience upon request. N. Y. State preferred but not essential. Address: Box 784, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

Practical, technical progressive foundryman. Well versed in all departments. Light production and heavy jobbing. Capable of taking full charge. Age 43. Address: Box 143, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT—FOREMAN

Desires position as superintendent or foreman, qualified and experienced to direct all phases of foundry activities. Light to medium heavy work. Green and dry sand. Well versed in cupola operation. 23 years' experience, 40 years of age. Address: Box 149, FOUNDRY, Cleveland 13, Ohio.

PRACTICAL-TECHNICAL

Modern grey iron foundryman, age 49. Molder by trade, graduate metallurgist. Outstanding background of experience and ability in highly mechanized high production foundry, using most modern methods and equipment. Machine tool, high pressure castings, diesels, automotive. Sound in sand control, molding, cores, cleaning, working from blueprints and minimum costs. Wants to connect with sound reliable firm needing services of a high type foundryman to get results. Address: Box 139, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Fifteen years' experience cupola, electric furnace. Any kind of iron melted with close control at lowest cost. Versed in chemical and physical testing. Address: Box 129, FOUNDRY, Cleveland 13, Ohio.

SALESMAN

Young family man 32, veteran. Ten years' experience in all phases of nonferrous foundry desires opportunity with foundry supply or equipment manufacturers. Address: Box 148, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

MANAGEMENT NOTE

Are you interested in securing an experienced practical and technical foundryman with an exceptional background in iron and steel who has used most types of equipment in various lines of castings from small to medium large. Qualified to take complete charge of your foundry. Employed. For complete details and references address: Box 994, FOUNDRY, Cleveland 13, Ohio.

FOREIGN POSITION DESIRED

Desires position as superintendent or foreman. Qualified and experienced in ferrous and nonferrous metals, also some knowledge of steel. Well versed in all phases of foundry work. Twenty-three years' experience, 40 years of age. Address: Box 150, FOUNDRY, Cleveland 13, Ohio.

MANAGER—SUPERINTENDENT

Twenty-eight years of gray iron experience and some nonferrous. Outstanding practical and technical background. Have supervised as many as three hundred men, 125 tons daily, production and jobbing, mechanized or semi. Excellent cost man, ability to handle men and can obtain results. Age 47. Address: Box 991, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

Grey iron foundryman, age 48, 25 years' experience producing quality castings. Well versed in cupola, continuous melting, sand control, natural and synthetic, all types molding machines. Cost minded, work from blue prints. Desires connection with reliable firm. Address: Box 140, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY MANAGER

Twenty-six years in machine tool foundries. Experience covers all foundry operations. Specialized knowledge of foundry cost control, incentive systems, industrial relations, production methods and organization. Foundry consultant on sand and quality control, mechanization, cupola operation and general foundry problems. Age 42, now employed. Address: Box 797, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Fully qualified on large and small machine tool castings in gray iron. Good record on quality control, organizing ability, production and costs. Up to date on sand, metal and mechanization. Prefer foundry with over 200 men. Now employed. Address: Box 117, FOUNDRY, Cleveland 13, Ohio.

MOLDER

Experienced as molder on heavy class of work such as iron, brass, aluminum and also manganese. Also green and dry sand work. Thirty-five years' experience. Fifty-seven years old, in perfect health and free to travel. Address: Box 124, FOUNDRY, Cleveland 13, Ohio.

CUPOLA SUPERVISION

Operation 14 years' practical experience in all phases of cupola operation, 42 years of age. Best of references. Address: Box 985, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Grey iron-malleable—practical molder, melter, metallurgist experienced executive and consultant desires connection with company needing a man of my experience. Address: Box 151, FOUNDRY, Cleveland 13, Ohio.

METALLURGICAL ENGINEER

Three and a half years' experience in aluminum, magnesium and copper alloy foundry quality control; including melting, heat treating, mechanical testing and radiography. Government specifications. One and a half years in industrial and foundry sales. Married, Navy veteran. Address: Box 132, FOUNDRY, Cleveland 13, Ohio.

GREY IRON FOUNDRYMAN

Available. Capable, qualified and experienced to direct all phases of foundry activities. Light to medium heavy work. Green and dry sand. Well versed in cupola operation and metallurgy. Fifteen years in present executive position. Middle aged. Good appearance. Pleasing personality. Address: Box 603, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

FOUNDRY METALLURGIST

With broad experience in grey iron and steel foundry controls of metal, sand, heat treatment and inspection. Qualified to handle correspondence and promote good customer relationships. Currently employed as metallurgist with high production grey iron foundry. Address: Box 147, FOUNDRY, Cleveland 13, Ohio.

SHELL MOLDING

ENGINEER, PATTERNMAKER, AGE 33, SHELL MOLDING PIONEER. DESIGN PATTERN PLATES, EQUIPMENT, ETC. EXPERIENCED RESINS, SANDS, TECHNIQUES, CYCLES. PRESENTLY EMPLOYED, SEEKING ADVANCEMENT. ADDRESS: BOX 154, FOUNDRY, CLEVELAND 13, OHIO.

BUSINESS MANAGER

Mature, profit-minded, aggressive. Successfully managed five companies—three taken out of the red. Trained two successors, both made good. Qualified to carry complete administrative responsibility and develop all profitable possibilities. Excellent experience foundry, machinery and related lines. Address: Box 112, FOUNDRY, Cleveland 13, Ohio.

STEEL FOUNDRY EXECUTIVE

Can take complete charge of all foundry operations, small, medium or large or act as technical advisor to the chief executive. Education and experience data on request. Now employed. Address: Box 838, FOUNDRY, Cleveland 13, Ohio.

MANAGER OR EXECUTIVE ASSISTANT

Experienced as chief metallurgist of tractor works; production superintendent, sales engineer and works manager of foundry producing heat resistant and stainless castings. Desires position with progressive organization. Address: Box 141, FOUNDRY, Cleveland 13, Ohio.

WEIGHT ESTIMATING

Estimating of casting weights furnished by return mail. Accurate, reliable and confidential service. Automatic calculator equipment. Nominal fee. Send blueprints to: CHARLES E. ROLAND, ITASCA, ILLINOIS.

GENERAL CORE ROOM FOREMAN

Age 45, 26 years' experience—blocks, heads, all types automotive work. Compelte knowledge in all phases of core blowing, bench and sand mixes. Employed. Address: Box 115, FOUNDRY, Cleveland 13, Ohio.

METALLURGICAL-RESEARCH CHEMIST-ENGINEER

Swiss, widely experienced in foundry gray iron especially piston rings, individual cast, cylinder liners and pistons and all automotive castings in ordinary gray iron and ductile cast iron actually holding position in a large Swiss foundry seeks interesting position in a large specializing foundry in the States, Australia, New Zealand or elsewhere. Speaks English, German and French. Address: Box 157, FOUNDRY, Cleveland 13, Ohio.

PATTERNMAKER

First class wood metal patternmaker. Forty years' experience master work models, machine tool patterns. Capable of running small shop, work bench, estimate work or charge of large shop. Years' experience on work that saves money on castings by making pattern and core work and producing castings at low cost. Address: Box 158, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY ENGINEER

Graduate—12 years of jobbing and production foundry experience, both light and heavy work in grey iron steel and malleable. Some nonferrous. Work has been mainly in rigging, trouble shooting, iron melting and plant engineering covering equipment planning, installation and maintenance. Presently employed but desires change—references. Any location considered. Address: Box 164, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY ENGINEER

Thirteen years in modern, high production gray iron and malleable iron foundries. Practical working knowledge of all foundry operations. Well versed on pattern and core box layout, pattern rigging, straightening fixtures, molding problems, core making, scrap analysis and inspection. Will consider employment anywhere or any job capable of doing. Address: Box 165, FOUNDRY, Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Positions Wanted

MANAGER OR SUPERINTENDENT

Practical foundryman, gray iron and malleable. Exceptional background of all foundry operations. Core room, cupola, molding. Cost minded. Fifteen years' executive background. Good rigger for production. Address: Box 163, FOUNDRY, Cleveland 13, Ohio.

ENGINEER

Desires responsible position in foundry production or engineering. Experience in mechanized gray iron foundry as assistant plant engineer, 2 years; plant engineer, 2½ years. Presently employed. Age 30, married. Mechanical engineering graduate. Address: Box 162, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY METALLURGIST

Foundry Metallurgist (Scot.) arriving Canada early August, desires interviews Ontario. Age 29, married; experience gunmetal, aluminum, high phos and engineering irons, and special purpose irons, also centrifugal casting and testing, chilled iron, etc. Address: Box 167, FOUNDRY, Cleveland 13, Ohio.

Opportunity

MATCHPLATES

Have equipment to make pressure cast plates, core boxes and precision castings. Want someone interested in this work who can operate shop with foundry or patternshop. Have the experience to produce work. Address: Box 159, FOUNDRY, Cleveland 13, Ohio.

Wanted-To-Buy

WANTED

BRIDGE CRANES

ARNOLD HUGHES COMPANY

765 PENOBSCOT BLDG. DETROIT 26, MICH.

WOODWARD 1-1894

WANTED

Sandcutter—American Model "M" S9/70. Please give full description, condition, serial number, etc.

MOLINE IRON WORKS

MOLINE, ILLINOIS

WANTED

GRAY IRON FOUNDRY

Well established and aggressive manufacturer's agency located in Detroit is interested in obtaining an exclusive sales contract with a modern progressive gray iron foundry. We invite your inquiry and thorough investigation.

BOX 137

FOUNDRY CLEVELAND 13, OHIO

WANTED TO BUY

MULBARROS
SCREENERATORS
SIMPSON MIXERS—All Sizes.

UNIVERSAL MACHINERY & EQUIPMENT CO.
SHILLINGTON, PENNA.

WANTED

Beardsley & Piper speedmullor. Give age of machine and models you have available. Address: Box 153, FOUNDRY, Cleveland 13, Ohio.

WANTED

Need for production—Simpson Mixer, Raymond Mill, one or two vibrating screens. Please give full particulars. P. O. BOX 1351 CHURCH STATION, NEW YORK 8, N. Y.

Wanted-To-Buy

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address Box 578, FOUNDRY, Cleveland 13, Ohio.

WANTED

Used laboratory equipment for steel foundry. 1—tensile and bend testing machine. 1—10′ x 12′ sand blast room. Must be complete with shot cleaning and shot return system. Address: Box 144, FOUNDRY, Cleveland 13, Ohio.

WANTED

Hines aluminum pop-off flask, all sizes. Must be in excellent condition with aluminum jackets. Address: MARCH-BROWNBACK CO., POTTSTOWN, PA.

WANTED

One model 2F Simpson mixer. Must be latest model in good operating condition. State serial No. and price for immediate acceptance. Address: Box 130, FOUNDRY, Cleveland 13, Ohio.

WANTED

Used Dietert test core baking oven in good condition. Give price, age, etc. Address: Box 104, FOUNDRY, Cleveland 13, Ohio.

WANTED

1—#4 U. S. Rotary melting furnace complete, capacity 2000 lbs. Brass. Address: IMPERIAL CANTRELL MFG. CO., JELLICO, TENN.

WANTED

SANDSLINGER WANTED—Junior Tractor. Address Box 656, FOUNDRY, Cleveland 13, Ohio.

Available Capacity

AVAILABLE CAPACITY

We have some open capacity on floor for gray iron castings medium weight up to 1,000 lbs. Address: THE TELLURIDE IRON WORKS COMPANY, P.O. BOX 560, DURANGO, COLORADO.

OPEN CAPACITY

Pattern shop complete service. Prompt delivery, first class work. Location Michigan. Address: Box 160, FOUNDRY, Cleveland 13, Ohio.

Foundries For Sale

SMALL FOUNDRY FOR SALE

On New York Central Railroad side track in Lockport, New York. Floor space of molders approximately 11,000 square feet with exceptional dumping ground for disposal of slag and waste indefinitely at lowest expense over declivity on the land. Considerable foundry equipment thrown in for the price of assessed value of the real estate. Address: JEFFERSON UNION COMPANY, LOCKPORT, NEW YORK.

MAGNESIUM FOUNDRY

Located small Oklahoma town. Excellent labor, no union. Building 60′ x 130′ with clean office. Concrete floor throughout. Excellent equipment. Immediate possession. Several good accounts presently being serviced including government work. Price $25,000. Will consider lease or profit sharing arrangement with experienced foundry manager. Address P. O. Box #121 Broken Arrow, Oklahoma.

FOR SALE

Small jobbing and production foundry. Ten ton capacity—fully equipped, going and established terms—Wisconsin. Address: Box 111, FOUNDRY, Cleveland 13, Ohio.

NONFERROUS FOUNDRY

Modern brass and aluminum foundry located in Central Indiana industrial city of 50,000. Ten oil fired furnaces, two ovens, 12 molder stations, full line of machinery and tools. 6,000 lb. daily capacity. Excellent accounts. Attractive profits. Must sell due to other interests. Address: Box 138, FOUNDRY, Cleveland 13, Ohio.

Foundries For Sale

FOUNDRY BUSINESS FOR SALE

Location south east Massachusetts. Long lease, reasonable rent. High grade accounts. This shop is well equipped for jolt squeezer, jolt stripper and jolt rollover work. Excellent core facilities and cleaning room equipment. Owner must sell due to other interests. Wonderful opportunity for several ambitious partners. Address: Box 100, Foundry, Cleveland 13, Ohio.

FOUNDRY—GRAY IRON

Located southern Ill. town. Pop. over 10,000. Water and railroad transportation available. Labor plentiful. Foundry with 2 clear spaces 80x320, with overhead monorail. Has 2 No. 7 Whiting cupolas 72" in diameter. Contains equip. ideal for mechanized oper. Address: Box 358, FOUNDRY, Cleveland 13, Ohio.

FOR SALE OR LEASE

Gray iron foundry. Anniston, Alabama territory, 22,000 sq. ft. with #5 cupola ready to operate. For further information address: Box 131, FOUNDRY, Cleveland 13, Ohio.

NONFERROUS FOUNDRY FOR SALE

Metropolitan New Jersey, railroad siding, two pit and one tilting oil furnaces, 6 molding positions with two machines, also fully equipped machine shop and stable industrial product.

BOX 133

FOUNDRY CLEVELAND 13, OHIO

For Sale

FOR SALE

Core oven—8 x 16 x 5 high inside gas fired—automatic temperature controls. Four monorail lines through. 26 racks. Rare bargain at $1500.00.
Model D-1 pneumatic core truck slightly used—$50.00.
Crucible tongs—chain top for #50—$15.00.
Four inch wheel iron casters—50 cents each.

DONALD B. PHILLIPS
BOX 70
ALMA, MICHIGAN

FOR SALE

1—Centrifugal casting machine, model C—Vertical. Mfr. Centrifugal Casting Co., Tulsa, Okla. Capacity mold 40" dia. x 20" high. Motor drive 440-60-3, 0 to 1000 R.P.M. like new.

CLARK EQUIPMENT CO.
BUCHANAN, MICHIGAN

FOR SALE

One Herman rollover 3000#, one Handy Sandy HS7G, one Reda Furnace #550. All in excellent operating condition.

ARKANSAS FOUNDRY CO.
LITTLE ROCK, ARKANSAS

FOUNDRY EQUIPMENT
FOR SALE

1—International Molding Machine Size 14", Serial #70212, Type JSK-7. In excellent condition. Will sell for $2100.00.
1—Sly Tumbling Barrel 48" Dia. x 12 ft. with 40 H.P. Motor. Price $750.00.
1—Jeffry Sand Handling Unit. Not assembled. Capacity 30 Tons per hour. Price $3000.00.

THUNDER BAY MFG. CORP.
ALPENA, MICH.

FOR SALE

One 19′ Piqua blower for sale, Serial #1022, good condition, priced reasonable. Address: C & G FOUNDRY & PATTERN WORKS, INC., 2440 YANDES ST., INDIANAPOLIS 5, INDIANA.

Employment Service

EMPLOYMENT COUNSEL, INC.

"All The Name Implies"

JOHN COPE, Manager Foundry Dept.

Recruiting men for employers in the foundry industry throughout the nation. Openings in Steel, Malleable, Gray Iron and Non-Ferrous—Jobbing and Production. Salaries to $20,000.

PLANT MANAGERS	SUPERINTENDENTS
GENERAL FOREMEN	MOLD FOREMEN
CORE FOREMEN	MELTING FOREMEN
CLEANING FOREMEN	MAINTENANCE FOREMEN
PATTERN FOREMEN	METALLURGISTS
INDUSTRIAL ENGRS.	TIME STUDY ENGRS.

And all other Administrative and Sales Positions.

WRITE or CALL for registration.

Completely Confidential

SUITE 500
CHICAGO 2, ILLINOIS

7 WEST MADISON ST.,
FINANCIAL 6-2100

SALARIED PERSONNEL

$3,000-$25,000. This reliable service, established 1927, conducts confidential negotiations for high grade men who seek a change of connection under conditions assuring if employed full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.

SALARIED POSITIONS

$3,500 to $35,000. We offer the original personal employment service (established 42 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. Address: **R. W. BIXBY, INC., 101 DUN BUILDING, BUFFALO 2, NEW YORK.**

For Sale

FOR SALE OR FOR RENT

2—Milwaukee Briquetting Presses with electrical equipment. Model 350. New—1943.
1—Jeffrey MT-26 Crushing Mill for turnings, with motor.
1—Logeman Scrap Bailing Press. Model 36PCX, size of box 52 x 48 x 42; complete with hydraulic pump, oil tank, operating valves.
Above equipment used very little.

PAUL SINOWAY
1854 W. WEBSTER AVE.,
CHICAGO 14, ILL. BRUNSWICK 8-5550

EQUIPMENT FOR SALE

1—Osborn #712 Molding Machine
2—Osborn #601 Molding Machines
1—Model A.M. American Sandcutter
1—American Wheelabrator Tumblast 36" x 42" with skip hoist.
1—Milwaukee #60-B Jolt Rollover Pattern Draw Machine.
2—U. S. Johnson & Jennings #2 Jolt Squeeze Pin Lift Machines
1—27 x 36 American Wheelabrator

MARCH BROWNBACK CO., INC.
SOUTH & CHARLOTTE STS.
POTTSTOWN, PA.

EQUIPMENT FOR SALE

1—No. 4 A section Whiting Cupola with all the parts except stacks	$1,695.00
1—Plain-Jar, Poser Draw Type Machine #28144 with adjustable Flask Lifting Pins	2,850.00
1—Magnetic Separator for Brass Borings	250.00
2—Reelites Reels for Electric Hoist (SN 18697 & 18698) 3 Volts King Capacity 35—One never used @ $150.00 ea.	300.00
1—Type B M 75887 Sandblast Cabinets Size 20	500.00
1—Adams Jolt Squeeze Molding Machines	200.00
3—Arcade Squeezers @ $50.00 ea.	150.00
1—Middle sized Royer—New Belt	150.00

FRANK R. WESTWOOD
6398 THOMAS
PHONE—FLEMING 2264
KANSAS CITY, MISSOURI

FOR SALE

Used, good condition, type A.N. 30" draw 16". International Molding Machine. Address: Box 118, FOUNDRY, Cleveland 13, Ohio.

AMERICAN SAND CUTTER—FOR SALE

Six ft.; wired for 220 or 440 volts; 3 phase 60 cycle. Model K, excellent condition with extra new spare parts. Address: Box 108, FOUNDRY, Cleveland 13, Ohio.

For Sale

FOR SALE

Motors, Generators, Transformers from 1 HP to 2500 HP
World headquarters for T.E.F.C. and explosion proof motors.
World's largest inventory.

ELECTRIC EQUIPMENT CO.
ROCHESTER, N. Y.

FOR SALE

Simplicity gyrating screen, 3' x 8' "SS" 1 deck low head. Factory rebuilt—excellent condition. Complete with right hand V-belt, less motor.

SLINGER FOUNDRY CO., INC.
SLINGER, WISCONSIN

STERLING WHEELBARROW STEEL FLASKS

1 only 17 x 11—4½" Cope 3" Drag
61 only 17 x 12—3" Cope 3" Drag
2 only 17 x 12—3½" Cope 3" Drag
49 only 17 x 12—4" Cope 3" Drag
36 only 17 x 12—4½" Cope 3" Drag

MILWAUKEE FLUSH VALVE COMPANY
301 E. RESERVOIR AVENUE
MILWAUKEE 12, WISCONSIN

FOR SALE

San-Blo deluxe model core blower, model CB-40-D. Used very little and in excellent condition.

THE PROOF CO.

936 EAST 72ND ST. CLEVELAND 3, OHIO

FOR SALE

1—Type FS347 Ingersoll Rand centrifugal motor blower rated at 4400 CFM at 1.25 pounds pressure, with General Electric air weight control—40 HP motor, 220-440 V—60 cycle. Perfect condition—$2,000.00 f.o.b. St. Louis, Missouri. Address: CARONDELET FOUNDRY COMPANY, ST. LOUIS 10, MISSOURI.

FOR SALE

30 tons surplus stock of "E" grade seacoal facing reasonably priced. Address: Box 152, FOUNDRY, Cleveland 13, Ohio.

MACHINERY FOR SALE

2—Johnston & Jennings Jolt Pin Lift, Molding Machines, 30" x 36" table, 10" draw. ADDRESS GOLD FOUNDRY & MACHINE WORKS, 1618 SOUTH OSAGE ST., INDEPENDENCE, MO.

FOR SALE

1—Johnston & Jennings #918 jolt—rollover molding machine 44 x 54" table.
Draw 20 inches 2800 lb. capacity.
Very good condition price $1,750.00.

SCHMELLER ALUMINUM FOUNDRY CO.
3300 EAST 87th ST. CLEVELAND 27, OHIO
DIAMOND #1-3535

FOR SALE

15 Black Sivalis steel flasks, never used, size 22" x 48"—5" cope 6" drag. Removable bars in cope. Address: ALBE FOUNDRY CO., HAZLET, NEW JERSEY.

For Sale

FOR SALE
SAND BLAST EQUIPMENT

Wheelabrators-Tumblast size 48 x 42
Hurry, 4 more have been released for immediate sale priced 4 to $5000.00
Wheelabrator 4 Ft. Table Blast w/tables $1750.00
Wheelabrator 27 x 36 Tumblast good condition—rubber belt $3000.00.
Pangborn 1GF Air Tumble Bbl. 150# load cap. $450.00
Pangborn ES-207 Blast Cleaning Cabinet used for strip steel or bar stock $1750.00
Pangborn 8 ft. table with 7 28" tables $4000.00.
Pangborn 6 ft. LK swing door table, new in crate.
Pangborn 7GK5 rocker barrel.
Pangborn 3½ GK2 rocker barrel.
Sand Blast room 10 x 10, reasonable
Sand Blast Cabinets, pressure tanks, dust collectors and blowers. All sizes.
Contact us for your sandblasting needs or any surplus sandblasting parts and equipment you have for sale.
Will accept your small machines as trade in on any of the above equipment.

DIAMOND SALES INC.
5654 WEST JEFFERSON
DETROIT 9, MICHIGAN

FOR SALE

2—6' SIMPSON MIXERS.
1—MOLDERS FRIEND—5 American Sand Cutters.
1—JOHNSTON & JENNINGS 815B Rollover, Table 30 x 40", 15" draw.
14—SPO & OSBORN Cantilever Type, Portable Jolt Squeezers.
CORE OVENS—Gas and Electric.
2—HAMMOND DOUBLE END GRINDERS—7½ HP Motor.
20—STEEL TOTE BOXES—24" x 40" x 63" long.
14—NON-FERROUS MELTING FURNACES—gas—oil—coke fired.
1—50 HP SCHRAMM AIR COMPRESSOR.
HEAVY DUTY ROLLER CONVEYOR—12" and 30".
Send For Five Page Listing of Foundry Equipment.

UNIVERSAL MACHINERY & EQUIPMENT CO.
320 EAST BROAD STREET
SHILLINGTON, PENNA.
PHONES—READING 30311—40146

R. B. HARRISON,
MANAGER FOUNDRY DEPARTMENT

FOR SALE
TURBO BLOWERS WITH MOTORS

CFM	PRESS.	MAKE	CFM	PRESS.	MAKE
4500	16 oz.	G.E.	675	16 oz.	Spencer
4000	32 oz.	Spencer	660	20 oz.	A-B
4000	16 oz.	Spencer	650	16 oz.	Spencer
3500	40 oz.	Spencer	500	10 oz.	No. Am.
2800	1 oz.	Spencer	400	4.3 oz.	Spencer
2700	16 oz.	No. Am.	400	16 oz.	Spencer
2700	16 oz.	Spencer	340	20 oz.	A-B
2500	7 oz.	Sturt.	320	12 oz.	Spencer
2200	16 oz.	No. Am.	225	16 oz.	Spencer
2000	16 oz.	Spencer	180	15 oz.	Spencer
2000	2½ oz.	Spencer	9100	7" SP	Sturt.
2000	1 oz.	Spencer	1100	4½" SP	Bayley
1150	20 oz.	No. Am.	100	7" SP	Spencer
800	8 oz.	No. Am.			

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVE.
CLEVELAND 14, OHIO

FOR SALE

#918 Johnston & Jennings Jolt, Rollover & Pattern Draw Molding machine; table size 44" x 54"; no pit necessary $1,500.00
Herman Hi Speed Rollover & Pattern Draw Molding machine; 1500 lb. series; table size 36" x 48" $1,500.00
(2) REJ International jolt, squeeze, rollover, and draw molding machines; 800 lb. capacity; used very little .....Each $1,100.00
#91 Osborn Core Blower, with clamps . $650.00
Beardsley & Piper Turntable—16'; with 6 Champion Push Off machines $3,500.00
(2) Carl-Mayer Vertical Core Ovens—42' high; 32 carriers; each carrier has 3 shelves, size 26" x 92" .....Each $10,000.00

BALCHER MACHINERY COMPANY
1884 S. COMPTON ROAD
CLEVELAND HEIGHTS 18, OHIO
TELEPHONE: FAIRMOUNT 1-1186

FOR SALE

Wheelabrator for sale—36 x 42. Address: FAIRMOUNT FOUNDRY, INC., HAMBURG, PA. PHONE HAMBURG 555.

CLASSIFIED ADVERTISING

For Sale

FOR SALE

MOLDING MACHINES
8—13 x 8 Tabor power squeeze flask lift machine split pattern type.
1—International 14 x 8 jolt rollover draw.
2—Deuscher Stationary jolt squeeze.
2—SPO #611B Stationary Oscillating Jolt Squeeze Strippers.
BLOWERS FOR CUPOLAS AND FURNACES
2—15 HP Spencer-Turbine 2250 CFM at 16 oz.
10—High temperature blowers 1400° F. 9000 to 15000 C.F.M.
1—Connersville rotary 24 cu. ft. per rev. 6200 C.F.M.
Maxon-Premix Blowers for Gas ¼ to 1 HP.
2—5 HP 20-oz. Spencer Turbine Blowers.
2—2 HP 20-oz. Spencer Turbine Blowers.
METAL MELTING EQUIPMENT
5—1000# open flame brass melting furnaces, gas fired.
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired.
New 32" to 41" dia. shell cupolas made to order.
TUMBLING MILLS AND SAND BLAST
1—Pangborn Sand Blast Unit, including generator tank, shot cleaner, bucket elevator. Suitable for use with room.
MISCELLANEOUS
1—Sullivan WJ-3 2-stage air compressor, 500 cu. ft., 100# pressure.
1—Stoney crane type shakeout.
1—Dings type M magnetic separator.
1—NC-4 sand separator.
1—NB-2 sand separator.
1—#1 Demmler core blower.
2—#16 Roto-clone units complete.
25 Tons steel flasks in sizes from 26 x 26 to 60 x 60.
4—Heavy Duty Flexible Shaft Grinders 2 HP.
Complete stock of rebuilt mill and dust exhaust blowers.

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FURNACES FOR SALE

Seven used heat treating furnaces, good condition. Suitable for heat treating armor castings and 7-ton gantry crane. Available for immediate delivery. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

FOR SALE—STACK MOLDING MACHINE

1—International type JSK-7 jolt squeeze pin strip molding machine. Practically new and in excellent condition, used less than three months. Also, 60 aluminum stack flasks for same, size 13" x 26" x 3".

VESTAL STOVE COMPANY
SWEETWATER, TENNESSEE

FOR SALE

USED HOUGH PAYLOADERS HA MODELS WITH HARD RUBBER OR AIR TIRES IN FIRST CLASS MECHANICAL SHAPE. PRICED RIGHT. ADDRESS: CONSTRUCTION EQUIPMENT CORP., 2118 S. 7th ST., ST. LOUIS 4, MO., PHO: SIDNEY 1070.

FOR SALE

Pangborn 6' rotary sand blasting table, direct pressure, 4 Norbide nozzles, machine designed for wheelpeening, shot peening or flatwork. Price—$1000.
Sandblasting room 13' x 9' x 7' with 2000 lb. generator. Macleod gravity feed. Price—$650.00.
Pangborn suction type cabinet 5' x 3'. Price—$210.00.
Pangborn section type cabinet 4' x 4'. Price—$150.00.
Pangborn 2 hopper dust collector, 1400 cfm direct connected to 3 HP electric motor and blower. Price—$500.00.
Pangborn Macleod one hopper dust collector, 720 c.f.m. with 1½ HP motor and blower. Price—$240.00.
Worthington air compressor 9 x 9 horizontal, 210 c.f.m. roller bearing—excellent shape. Price—$900.00.
Gardner Denver Air compressor, 5 x 4 vertical water cooled 2 stage type VAC, 1000 64 c.f.m. 10 HP motor, complete starter constant speed unloader. Price—$700.00.
Curtis 4¼ x 4 water cooled, 2 cylinder air compressor. Base mounted 7½ HP electric motor, unloader, air receiver. Price $500.00.

M. ELSTEIN
141 MANGIN STREET
NEW YORK 2, NEW YORK

For Sale

FOR SALE

1—International type PK Jolt Squeeze Pin Lift 18" cylinder, 8" lift
1—International Plain Jolt—18" x 24" Table
1—Champion Core Roll-over, 16" x 8", Portable
1—1-ton Gear Ladle
1—3 HP Stand Grinder
1—2-ton Lo-Hed Hoist, 220 V., D.C.

RAY P. SCULLY
SCULLY MACHINERY & EQUIPMENT CO.
767 MILWAUKEE AVE. CHICAGO 22, ILL.
PHONE: CANAL 6-0314

FOR SALE

One Stroman reverberatory brass melting furnace, 800 lb. capacity, oil fired serial No. 912, with loader and No. S-1333-3 blower, and some surplus lining brick. This is a good used furnace. Price $2000.00 f.o.b. our plant. Subject to prior sale. Address: NORTHERN INDIANA BRASS COMPANY, 935 PLUM STREET, ELKHART, INDIANA.

FOR SALE

3—Tilting Swing Head cover brass furnaces, No. 300 crucible.
1—Pedestal Grinder with 5 HP. Motor.
1—Covered Worm Geared Ladle, 1000 lb. cap., made by Modern Equip. Co.
1—Whiting Slag Ladle.
1—Worm Geared Covered Ladle, 400 to 600 lb. for Pouring Device.
1—10 Ton Whiting Worm Gear Ladle.
2—1000 lb. Worm Gear Ladles.
2—2 Ton Worm Gear Ladles.
1—7 Ton Worm Gear Ladle.
1—JFL International Power Jolt Foot Lift Machine.
1—JDP. International Jolt Stripper, 600 x 8.
1—International "G" Machines 20 x 8.
1—Osborn Bumper 24 x 36.
1—International Jolt Squeezer.
1—#42 Osborn Core Rollover Machine.
1—Arcade 20 x 8" Hand Rollover Power Jolt Foot Draw Machine.
1—International HJ. 20 x 4" Machine.
1—International HJ. 20 x 6" Machine.
1—24" Electric Riddle.
2—20" Gyratory Electric Riddles.
3—Universal Electric Riddles.
1—American Sand Cutter Machine Size 89/70 M.
1—Sprue Cutter with 2 HP. Motor.
1—36 x 54 Late Model Whiting Tumbling Barrel complete with Jones Speed Reducer & 7½ HP. Motor.
1—Jeffrey Sand Conditioner.
1—Royer Sand Conditioner.
1—Wells Metal Band Saw Type 9M42.
1—General Blower, 3 HP. Motor, 16 oz. pressure, 220 or 440, 3 phase, 60 cycle, 375 CFM.
83—Set Truscon Pressed Steel Flasks, 15 x 20, 8 Cope, 3 Drag.
1—#3-E Demmler Core Blower.
1—#1 Demmler Core Blower.
50—Ladles from 200 to 1000 lb. cap.
2—Mixing Ladles U Type, 3000 lb. capacity.
7—Pouring Devices FA-9.
1—Fairbanks scale, 500 lb. capacity, movable platform.
2—New Carbide Furnace Covers, 30" diameter, 8" hole.
1—Sand Blast Generator Tank.
2—Grinders.
1—Sander.
2—Elec. Drills.
1—Simplicity.
3—Beardsley & Pipers.
3—Screens for Beardsley & Pipers.

HAYNES FOUNDRY EQUIPMENT CO.
814 ADA ST. KALAMAZOO 52, MICH.

FOR SALE

One—#3 Wheelabrator multi table suitable for cleaning furnace or other large type castings. Good condition—not an old machine. Price $6000.00. Address: E. D. COOK, HENRY FURNACE CO., MEDINA, OHIO.

FOR SALE—AIR HOISTS

Ingersoll-Rand type D, 4,000 lb. capacity, 25' lift, perfectly reconditioned, new equipment guarantee, price $525.00. Address: HAYNES EQUIPMENT CO., INC., 144 FULTON ST., NEW MILFORD, N. J.

For Sale

FOR SALE

SPO #9336 jolt squeeze rollover molding machine and SPO #2134 stationary jolt squeeze cope molding machine, up to 28" pattern. Used little.

THE PROOF COMPANY
936 E. 72nd ST. CLEVELAND 3, OHIO

ARE YOU LOOKING FOR STEEL FOR A NEW BUILDING?

We have available steel framework for a building 60' x 140' long and 21'6" to the bottom cord of truss. Columns are mounted with brackets for crane way. Send for additional information, if interested. This material can be purchased without priority. Address: BERGEN POINT BRASS FOUNDRY, INC., AVENUE A AT SIXTH ST., BAYONNE, NEW JERSEY.

YOUR CLASSIFIED ADVERTISEMENT IN FOUNDRY BRINGS RESULTS!

IF YOU ARE SEEKING A CHANGE OF POSITION TO BETTER YOUR SITUATION AND ARE QUALIFIED FOR A BETTER JOB, TELL THE 45,000 READERS OF FOUNDRY ABOUT IT.

DON'T "HIDE YOUR LIGHT UNDER A BUSHEL"—THERE ARE TIMES WHEN A MAN SHOULD TALK ABOUT HIMSELF AND THERE ARE A LOT OF MEN QUALIFIED FOR BETTER POSITIONS WHO DO NOT KNOW HOW TO GO ABOUT IT OR WHERE TO SEEK HIGHER RESPONSIBILITIES.

YOUR CLASSIFIED ADVERTISEMENT IN FOUNDRY WILL BE WIDELY READ AND THE RESULTS MAY SURPRISE YOU!

IT COSTS BUT LITTLE. WHY NOT RUN AN ADVERTISEMENT ABOUT YOURSELF IN TWO OR THREE ISSUES?

WRITE

FOUNDRY

CLASSIFIED ADVERTISING DEPT.

PENTON BLDG., CLEVELAND 13, OHIO

FOR SALE

2—24″ x 24′ Belt Conveyors, 5 H.P. 220/440V. 3ph. 60cy.
1—#405-79 Osborn Rollover and Pattern Draw Molding Machine.
1—#405 Osborn Rollover and Pattern Draw Molding Machine.
1—#147 Osborn Rockover and Draw Machine, for long jobs.
4—#814-P Osborn Jolt Squeeze Strippers, 14″ squeeze cyl., 700# jolt cap.
2—601-13 Osborn Jolt Rollover and Pattern Draw, 600# jolt cap., 10″ draw, flask size 30″ x 24″.
2—Tabor Jolt Squeeze Molding Machines.
1—Spo Jolt Squeeze Molding Machine, #110-P.
3—Model 2166 Spo Jolt Squeeze Pin Lift Molding Machines.
1—International Jolt Ram, Power Pin Lift, Type JDP Molding Machine, 1200# cap., 8″ draw.
1—#1 Demmler Core Blower—New.
1—#3E Demmler Core Blower, A-1 cond.
1—Simplicity Shakeout (Core Knock-out) 4′ x 8′.
1—Simplicity Shakeout, 4′ x 6′, ser. #46-SOB-232.
1—Kane & Roach Wire Straightener, 3/16″ to ½″ wire 7½ H.P., 440V. 3ph. 60cy.
1—#404 Clearfield Muller, 4 cu ft. 220V. 3ph. 60cy.
1—3 H.P. double stand grinder, belt driven.
1—40 H.P. Pennsylvania Air Compressor.
2—3 H.P. Blowers for furnaces.
1—5 H.P. Blower for furnace.
2—Micromax Instruments Leeds & Northrup Temperature Control.
2—Spencer Turbine Cupola Blowers with 50 H.P. motors, 220/440V., 3ph. 60cy., A-1 cond.
1—Revolving Core Conveyor Table (Busch-Lawrence) like new.
1—Fin Cleaning Machine (Ireland) for cleaning fins on castings, like new.
1—American Wheelabrator, 48″ x 42″. Model 450 ser. #A24119 A-1 cond.
1—Eclipse Salt Bath Furnace, M-225, gas fired.
1—Jones Worm Gear Reducer, Driving shaft 900 RPM, Ratio 8 to 1, Mounted on C.I. base with 15 H.P. Allis-Chalmers motor, 3ph. 60cy. 440V. 1150 RPM.
1—Coleman Horizontal Continuous Mold Oven oil fired, recirculating heating system, forced cooling system. 54′0″ long incl. cooling zone x 15′0″ wide, 8′8″ high. Length of conveyor 76′0″. 440 V. 3 ph. 60 cy. motors.
Various sizes of used Steel Flask.
Various sizes of Hines Popoff Flasks and Jackets.

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.
15019 Saranac Rd., Cleveland 10, Ohio Telephone—GLenville 1-1538

CLASSIFIED ADVERTISING RATES

POSITION WANTED — Minimum advertisement set solid, 30 words or less, $2.50. Additional words 9c each.

ALL OTHERS—"Help Wanted"—"For Sale"—"Wanted"—"Personals"—"Services", etc., minimum advertisement set solid, 30 words or less, $5.00. Additional words 15c each.

NOTE—If replies are to be sent to a box number in care of FOUNDRY, add 6 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

INCH RATES PER INSERTION

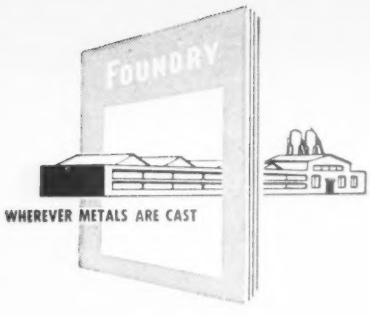
Single Column 2¼″ Wide	One Time	Three Times	Six Times	Twelve Times
1 inch	$ 15.00	$ 13.75	$ 12.50	$ 11.25
2 inches	27.00	25.00	23.00	21.00
3 inches	40.00	36.50	33.50	30.00
4 inches	50.00	46.00	41.50	37.50
5 inches	60.00	55.00	50.00	45.00
6 inches	73.50	66.50	60.00	53.50
7 inches	82.50	75.00	67.50	60.00
8 inches	91.50	83.50	75.00	66.50
1 column	110.00	100.00	90.00	80.00
Half Page	162.50	150.00	137.50	125.00
Full Page	275.00	250.00	225.00	200.00

Remittance should accompany advertisement when submitted—Cash Discount 2%, 10 days.

Classified Forms Close the 13th of Month Preceding Issue

FOUNDRY

Penton Building, Cleveland 13, Ohio



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Penton Building, Cleveland 13, Ohio
Main 1-8260

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Also publisher of STEEL • MACHINE DESIGN
NEW EQUIPMENT DIGEST

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29 West 39th St., New York 18.

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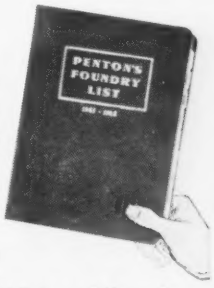
IF YOU WANT TO SELL FOUNDRIES— USE THESE AIDS

FOUNDRY MARKETING GUIDE

Contains an *Atlas* section defining the concentration of foundry capacity, production, and employment in 96 marketing areas. Has *State* section devoted to analysis of foundry capacity and employment in each of the United States and Provinces of Canada. Includes *comprehensive list* of Foundry Supply Houses and Agents. An outline Foundry Market Area map facilitates user-analysis of own sales potentials.

PENTON'S FOUNDRY DIRECTORY



A geographical listing of all foundries giving names, addresses, metals melted, melting equipment used, and departments operated. It lists every one of the more than 5,000 foundries in the U.S.A. and Canada. Cost, $75.00.

FOUNDRY DATA FILE

"Sizing Up The Foundry Market" presents new facts about this market, its growth, its future and its coverage by FOUNDRY. Complete information on circulation, readership, editorial, and mechanical details. A must for every media file.

Please send me:

- ☐ Foundry Marketing Guide (free)
- ☐ Penton Foundry List ($75)
- ☐ Foundry Data File (free)

Name_____

Company_____

Address_____

City_____ State_____

NBP CCA **FOUNDRY**

A Penton Publication
Penton Building
Cleveland 13, Ohio

"Jack of Michigan"

JACK LATHROP

"Jack of Spades"

Dear Reader:

We'd like to have you join us in a toast—to Jack Lathrop.

It can be a cool glass of Sherburne (N. Y.) spring water or a dry martini (with anchovy olive) . . . Jack is partial to both!

The occasion?

If you are one of the hundreds of foundrymen and foundry suppliers who have known Jack over the years, you know that the occasion of being together is sufficient reason for a friendly toast to the fellowship of foundrymen. However, there is added reason for *this* tribute to Jack and it is our privilege and pleasure to propose it.

Jack probably has told you of his fishing exploits in Michigan . . . of his cabins along the lake . . . of the rare, whistling swans which return annually to his place up north—so, as another summer approaches, Jack is assuming an even happier and bigger assignment than was his for many years as Advertising Manager of FOUNDRY. In responding to the congratulations of his associates recently upon completion of 25 years of service with FOUNDRY, Jack surprised many of us by announcing plans to retire from active duty in the near future. While our masthead won't seem the same without Jack's name there, his influence will remain—and if he doesn't appear at an occasional foundry show or staff meeting, we'll be surprised (and disappointed).

Jack, here's to your good health and happiness in the years ahead! We'll miss the card fans and four aces for which you were famous—we'll remember your mystifying effects with lighted cigarettes—we'll chuckle as we recall your original experiment of the Oriental date seed—we won't forget that the accidental loss of a finger tip merely caused you to use conventional sized rather than the world's largest billiard balls. Thanks, Jack, for many hours of delightful entertainment and the respects of your staff for a job well-done in adding to the growth and service of FOUNDRY.

And to you, dear reader, may we convey warm greetings from Jack and best wishes from him to you as each of you pursue your respective futures?

Sincerely,

F. A. Taylor

Business Manager,
FOUNDRY

June 26, 1952

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Two Stage Air Cooled 15 and 20 Horse Power

designed to give you even greater dependability lower cost operation longer life

Features that make the number 98 compressor truly outstanding:

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4. Timken Main Bearings — provide easy external adjustment
5. Four section Finned Intercooler — effective cooling between stages
6. Valves readily removable as assembled units
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8. Experience backed by 98 years of "Know-How"
9. Also furnished in both base and tank mounted units

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Vertical Air Hoists **for Low Cost Lifting or Lowering of Materials or Machines**

Air Cylinders **for Almost Any Pushing, Pulling or Hoisting Operation**

CURTIS PNEUMATIC MACHINERY DIVISION
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1922 Kienlen Ave., St. Louis 20, Mo.

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Firm.....

Street.....

City..... Zone..... State.....

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CURTIS PNEUMATIC MACHINERY DIVISION of Curtis Manufacturing Company

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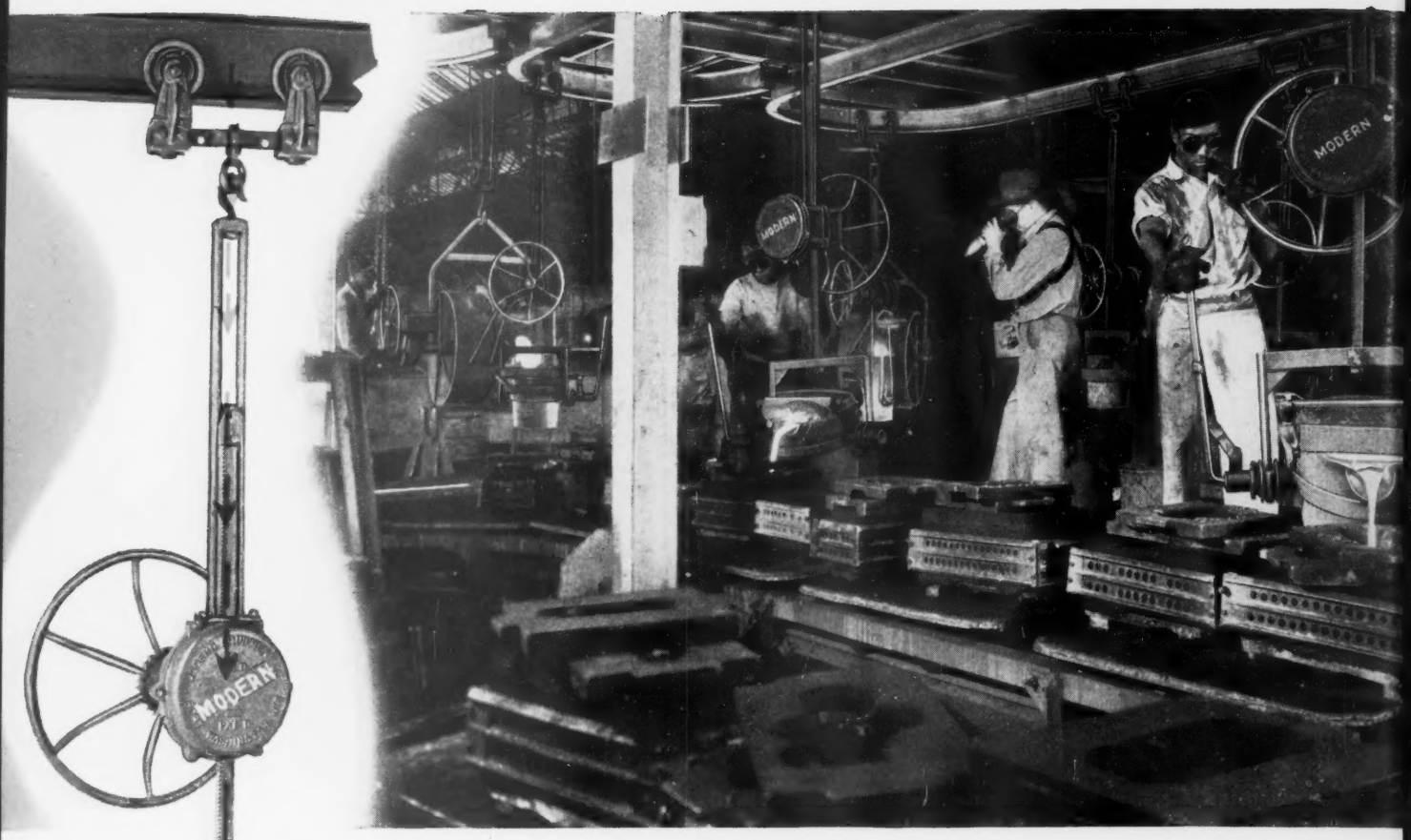
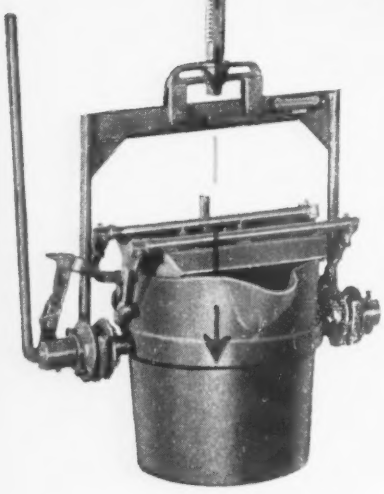
A LIFT for your POUR-OFF-MEN





Rigid, straight-line control from monorail to ladle spout for quick accurate spotting over the sprues.

WORKING TOGETHER WITH PRACTICAL FOUNDRYMEN...

MODERN engineers developed the Pouring Device. That's how our business began!

Today this MODERN one-man-pouring method, as proved in a quarter century's service to foundries, is highly productive — both for the foundry that sets up a floor or two a day, as well as for the large manufacturer* with his most elaborate, double-loop conveyor system.

The MODERN cylindrical ladles, together with their 2000 pound loads of gray iron, are trucked from the cupolas to the pouring floor. In this MODERN equipped operation up to 70 tons of tractor cylinder liners, heads and manifolds are poured in an 8 hour shift. Several of the ladles and the MODERN "FA" Pouring Devices have been in operation since 1938. Herein is a timely story on the effective distribution of manpower. You can read more about it in catalog 147: It's free to foundrymen who make request on their company letterheads to — Dept. -F-7, MODERN EQUIPMENT COMPANY, Port Washington, Wisconsin.

*Allis-Chalmers, Milwaukee

MODERN EQUIPMENT CO.
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